DECLARATION

SELECTED REMEDIAL ALTERNATIVE FOR THE 12th STREET LANDFILL-OPERABLE UNIT 4 OF THE ALLIED PAPER, INC./PORTAGE CREEK/KALAMAZOO RIVER SUPERFUND SITE CITY OF PLAINWELL, MICHIGAN

Statement of Basis and Purpose

This decision document presents the selected remedial action (RA) for the 12th Street Landfill-Operable Unit 4 (12th St.-OU4) of the Allied Paper, Inc./Portage Creek/ Kalamazoo River Superfund site (Site). The 12th St.-OU4 is one of several polychlorinated biphenyl (PCB) source areas attributed to the potentially responsible parties (PRPs) at the Site. The remedy was chosen in a manner that is consistent with the Comprehensive Environmental Response, Compensation, and Liability Act, 1980 PL 96-510 (42 U.S.C. § 9601 et. Seq.), as amended by the Superfund Amendments and Reauthorization Act of 1986, as well as the Superfund implementing regulations of the National Oil and Hazardous Substances Pollution Contingency Plan (40 Code of Federal Regulations (CFR) Part 300). This Record of Decision (ROD) is applicable only to the 12th St.-OU4, which comprises the 12th Street Landfill (landfill) and four areas outside the landfill where PCB-contaminated residual material has eroded.

The 12th St.-OU4 is located near the city of Plainwell, Allegan County, Michigan (Figure 1). PCBs are present in the paper residuals (residuals) disposed of at the landfill by the owners and operators of the Plainwell Paper Mill. Due to erosion, the PCB-contaminated residual material has migrated from the landfill to the adjacent areas. Listed below are the PCB-contaminated areas that comprise this operable unit (Figure 2).

1. The landfill from which the PCB contamination in surrounding areas migrated, including any groundwater contamination and landfill leachate, if any.
2. The woodland area (woodland) in the southeast corner of the 12th St.-OU4.
3. Wetlands, as identified by National Wetland Inventory maps, adjacent to the landfill to the north and northwest (wetlands).
4. A portion of the adjacent gravel operation property (adjacent property), that borders the landfill to the west.
5. The portion of the former powerhouse discharge channel of the Plainwell Dam (former powerhouse discharge channel) on the Kalamazoo River that contains residuals that are contiguous with the east side of the landfill.

Assessment of the Site

The actual or threatened releases of hazardous substances from the 12th St.-OU4, if not addressed by implementing the RA in this ROD, present an imminent and substantial endangerment to public health, welfare, or the environment.

Description of the Selected Remedy

The purpose of this remedy is to eliminate the continued migration of PCBs from the 12th St.-OU4 to the Kalamazoo River, as well as from the landfill to the woodland, wetlands, adjacent property, and the former powerhouse discharge channel. This remedy will reduce, and possibly eliminate the unacceptable risk associated with the landfill from exposure to PCBs. This RA includes excavating the eastern portion of the landfill adjacent to the former powerhouse discharge channel and the Kalamazoo River; excavation of residual material that has eroded into the areas outside the landfill; relocation of the excavated material back into the landfill; and, construction of an on-site containment system.

This ROD covers the landfill and the residual material that is present in the adjacent areas that are listed above. The remaining portion of the former powerhouse discharge channel and those locations within the adjacent areas where there is no visual evidence of residual material are not addressed in this RA. Visual criteria will be the primary method by which PCB-contaminated materials will be identified, although this ROD does provide that the agency implementing this remedy can require additional sampling and analysis at those locations where it determines that visual criteria alone are inadequate to determine the extent of eroded, PCB-contaminated materials. The selected remedy further provides for post-excavation sampling in order to determine whether, upon completion of the remedy selected in this ROD, additional remedial work is necessary to reduce the risk to human health or the environment to levels acceptable under applicable or relevant and appropriate requirements. If such post-excavation sampling determines that unacceptable risks remain, additional remedial work will be required in future RODs for the site.

The major components of the selected remedy include:

1. Excavation and relocation into the landfill of contaminated residuals currently in the woodland, wetlands, and adjacent property, and the residuals in the former powerhouse discharge channel that are contiguous with the eastern side of the landfill. Following relocation into the landfill of the residual material, a containment system shall be constructed that complies with the requirements of Part 115, Solid Waste Management, of the Natural Resources and Environmental Protection Act, 1994 PA 451, as amended (NREPA).

2. Excavation and relocation into the landfill of the east side of the landfill along the former powerhouse discharge channel. The excavation shall be extensive enough to create a buffer zone sufficient to insure that, for the lifetime of the remedy, no hydraulic connection exists between the PCB-contaminated wastes within the newly constructed landfill containment system and the Kalamazoo River or the former powerhouse discharge channel.

3. Restoration of areas that are excavated, cleared and grubbed, or otherwise affected by the RA.

4. A side wall containment system (SWCS) shall be constructed around the outside of the landfill. The existing sides of the landfill are constructed of sand, fly ash, and PCB-contaminated residuals and were not designed to provide side slope stability, flood protection, and erosion control, or to prevent releases of leachate. The existing sides shall be completely covered by a new SWCS that is designed to prevent the release of PCBs and which provides the necessary side slope stability, flood protection, and erosion control. The containment system shall be designed to meet the relevant portions of the Michigan Solid Waste Landfill closure regulations pursuant to Part 115, Solid Waste Management, of the NREPA. Disposal of the residuals with PCB contamination at or above 50 parts per million, which are PCB remediation wastes under the Toxic Substance Control Act (TSCA), will take place pursuant to the risk-based disposal method set forth in 40 CFR Section 761.61(c). The erosion protection provided shall be sufficient to protect the containment system from a 500-year flood event. The erosion protection shall extend to a minimum elevation of 707.0 feet above mean sea level, which is two feet above the 100-year flood elevation.

5. A cover (cap) will be constructed over the landfill as part of the containment system to minimize infiltration of precipitation through the landfill, prevent migration of residuals or leachate from the landfill into the adjacent areas, and eliminate direct contact hazards. The cap shall be designed to meet relevant portions of the closure regulations pursuant to Part 115, Solid Waste Management, of the NREPA. The cap consists of the following components from bottom to top:

    - A select granular fill layer at least six inches thick shall be placed on top of the landfill as a suitable sub-grade for the cap. The need for a gas venting system shall be assessed by the PRP's in the remedial design (RD). If it is determined that a gas venting system is necessary, then this layer shall be designed and constructed to serve as a gas-venting layer. This gas-venting layer shall be capable of collecting the landfill gas produced and efficiently conveying it to a passive venting system. Clean granular fill from an off-site source, having a minimum hydraulic conductivity of 1×10^{-3} centimeters per second, shall be used to construct the layer.

    - A geomembrane liner (barrier layer) of at least 30-mil thick polyvinyl chloride (PVC) or its equivalent, as approved by the lead agency, shall be placed over the granular fill. The PVC geomembrane liner shall act as a barrier to minimize infiltration of precipitation into the residuals. The most appropriate liner material shall be determined in the RD and must be approved by the lead agency.

- A general fill layer (protective layer) at least 24 inches thick shall be placed above the 30-mil PVC geomembrane liner, or its equivalent. The protective layer shall be capable of sustaining the growth of nonwoody plants and shall have adequate water holding capacity. The water that accumulates within this layer shall drain to a ditch or a sedimentation outlet structure and subsequently discharge into the Kalamazoo River.

- A vegetative layer at least six inches thick shall be placed over the protective layer. This layer shall be designed to promote vegetative growth, provide surface water runoff, and minimize erosion.

6. Following the completion of the RA, an appropriate groundwater monitoring network shall be installed and long-term groundwater monitoring shall be performed in accordance with an approved monitoring plan. Existing wells that are no longer in use shall be properly abandoned. Monitoring of the groundwater aquifer under the landfill shall be conducted in accordance with Part 201, Environmental Remediation, of the NREPA, and the TSCA (40 CFR Section 761.75(b)(6)).

7. Short-term surface water monitoring shall be conducted during excavation activities in accordance with a lead agency approved monitoring plan.

8. Deed restrictions, approved by the lead agency, that are necessary to appropriately restrict future land use pursuant to Section 20120a(1)(i) of the NREPA shall be imposed on the landfill portion of the 12th St.-OU4 before the RA is final.

9. A fence shall be constructed to enclose the landfill and permanent markers and approved warning signs shall be placed around the perimeter of the landfill as required by Part 201, Environmental Remediation, of the NREPA.

10. The need for a leachate collection system shall be investigated by the PRPs in the RD and shall be designed and constructed as part of the RA if determined to be necessary by the lead agency.

11. Provisions for long-term maintenance and post-closure care, approved by the lead agency, shall be implemented.

Statutory Determinations

The lead agency has concluded that the selected RA for the 12th St.-OU4 is necessary and appropriate to protect human health, safety and welfare, and the environment. The selected RA is in compliance with federal and state requirements that are legally applicable or relevant and appropriate. The United States Environmental Protection Agency (U.S. EPA) concurs with this determination. The selected RA for the 12th St.-OU4 utilizes permanent solutions and alternative treatment technologies, or resource

recovery technologies, to the maximum extent practicable. A final decision on whether additional response actions are necessary for those areas of this OU not addressed in this ROD will be made as part of the ROD for the Phase I portion of the Kalamazoo River.

To ensure that the remedy continues to provide adequate protection of human health and the environment, a review shall be conducted within five years after commencement of the RA, and every five years thereafter. This shall be necessary because this remedy will result in hazardous substances remaining on-site above health-based and ecological based levels.

The lead agency's submission to the U.S. EPA of this ROD and its related documents (e.g., the RI/FS) and its request for concurrence with the determination of this ROD, constitute the application for risk-based disposal approval required by 40 CFR Section 761.61(c)(2), and represents U.S. EPA's determination that the disposal method set forth in this ROD for PCB remediation wastes will not pose an unreasonable risk of injury to human health or the environment.

William E. Muno, Director, Superfund Division
United States Environmental Protection Agency

Date

Russell J. Harding, Director
Michigan Department of Environmental Quality

9/28/01
Date

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Wm. E. Muno — 9/28/01

William E. Muno, Director/ Superfund Division — Date
United States Environmental Protection Agency

Russell J. Harding, Director — Date
Michigan Department of Environmental Quality

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ACRONYMS FOUND IN THE 12TH St.-OU4 ROD

12th St.-OU4	**12th Street Landfill Operable Unit 4**
AOC	**A**dministrative **O**rder by **C**onsent
ARARs	**A**pplicable or **R**elevant and **A**ppropriate **R**equirements
BERA	**B**aseline **E**cological **R**isk **A**ssessment
CAC	**C**itizens **A**dvisory **C**ommittee
CERCLA	**C**omprehensive **E**nvironmental **R**esponse, **C**ompensation, and **L**iability **A**ct, 1980 PL 96-510
CFR	**C**ode of **F**ederal **R**egulations
CWA	**C**lean **W**ater **A**ct
FFS	**F**ocused **F**easibility **S**tudy
FML	**F**lexible **M**embrane **L**iner
GAC	**G**overnment **A**dvisory **C**ommittee
GSI	**G**roundwater/**S**urface Water **I**nterface
HHRA	**H**uman **H**ealth **R**isk **A**ssessment
KHL-OU3	**K**ing **H**ighway **L**andfill **O**perable **U**nit **3**
KRPA	**K**alamazoo **R**iver **P**rotection **A**ssociation
MDEQ	**M**ichigan **D**epartment of **E**nvironmental **Q**uality
mg/kg	**M**illi**g**rams per **K**ilo**g**ram
MIOSHA	**M**ichigan **O**ccupational **S**afety and **H**ealth **A**ct 154
MSL	**M**ean **S**ea **L**evel
MUCC	**M**ichigan **U**nited **C**onservation **C**lub
ng/Kg	**N**ano**g**rams per **K**ilo**g**ram
NCP	**N**ational Oil and Hazardous Substances Pollution **C**ontingency **P**lan (40 CFR Part 300)
NPDES	**N**ational **P**ollutant **D**ischarge **E**limination **S**ystem
NPL	**N**ational **P**riorities **L**ist
NREPA	**N**atural **R**esources and **E**nvironmental **P**rotection **A**ct, 1994 PA 451, as amended
OU	**O**perable **U**nit
O&M	**O**peration **&** **M**aintenance
PCB	**P**oly**c**hlorinated **B**iphenyl
POTW	**P**ublicly **O**wned **T**reatment **W**orks
ppm	**P**arts **P**er **M**illion
PRPs	**P**otentially **R**esponsible **P**arties
PVC	**P**oly**v**inyl **C**hloride

ACRONYMS FOUND IN THE 12TH St.-OU4 ROD

RA	**R**emedial **A**ction
RD	**R**emedial **D**esign
RI	**R**emedial **I**nvestigation
RI/FS	**R**emedial **I**nvestigation/**F**easibility **S**tudy
ROD	**R**ecord **O**f **D**ecision
SRSL	**S**econdary **R**isk **S**creening **L**evel
SVOCs	**S**emi-**V**olatile **O**rganic **C**ompounds
SWCS	**S**ide **W**all **C**ontainment **S**ystem
TEQ	**T**otal **T**oxic **E**quivalency
TSCA	**T**oxic **S**ubstances **C**ontrol **A**ct
ug/l	**M**icrograms per Liter
U.S. EPA	**U**nited **S**tates **E**nvironmental **P**rotection **A**gency
VOCs	**V**olatile **O**rganic **C**ompounds
WPCA	**W**ater **P**ollution **C**ontrol **A**ct

SUMMARY OF REMEDIAL ALTERNATIVE SELECTION

I. DECISION SUMMARY

A. SITE LOCATION AND DESCRIPTION

The Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund Site (the Site) is located in Kalamazoo and Allegan Counties, Michigan. The Site includes the Kalamazoo River and its adjacent floodplains and wetlands, from Morrow Lake Dam in Comstock Township, Kalamazoo County, downstream to Lake Michigan, as well as the lower three miles of Portage Creek, from Cork Street to the confluence with the Kalamazoo River. Five paper residual disposal areas and six paper mill properties located along the Kalamazoo River and Portage Creek are also included as part of the Site. Based on data collected by the potentially responsible parties (PRPs), it is estimated that there are at least 350,000 pounds of polychlorinated biphenyls (PCBs) in the sediment and soils in and adjacent to Portage Creek and the Kalamazoo River. The Site has been divided into several Operable Units (OUs), one of which is the 12th Street Landfill (12th St.-OU4), the subject of this Record of Decision (ROD).

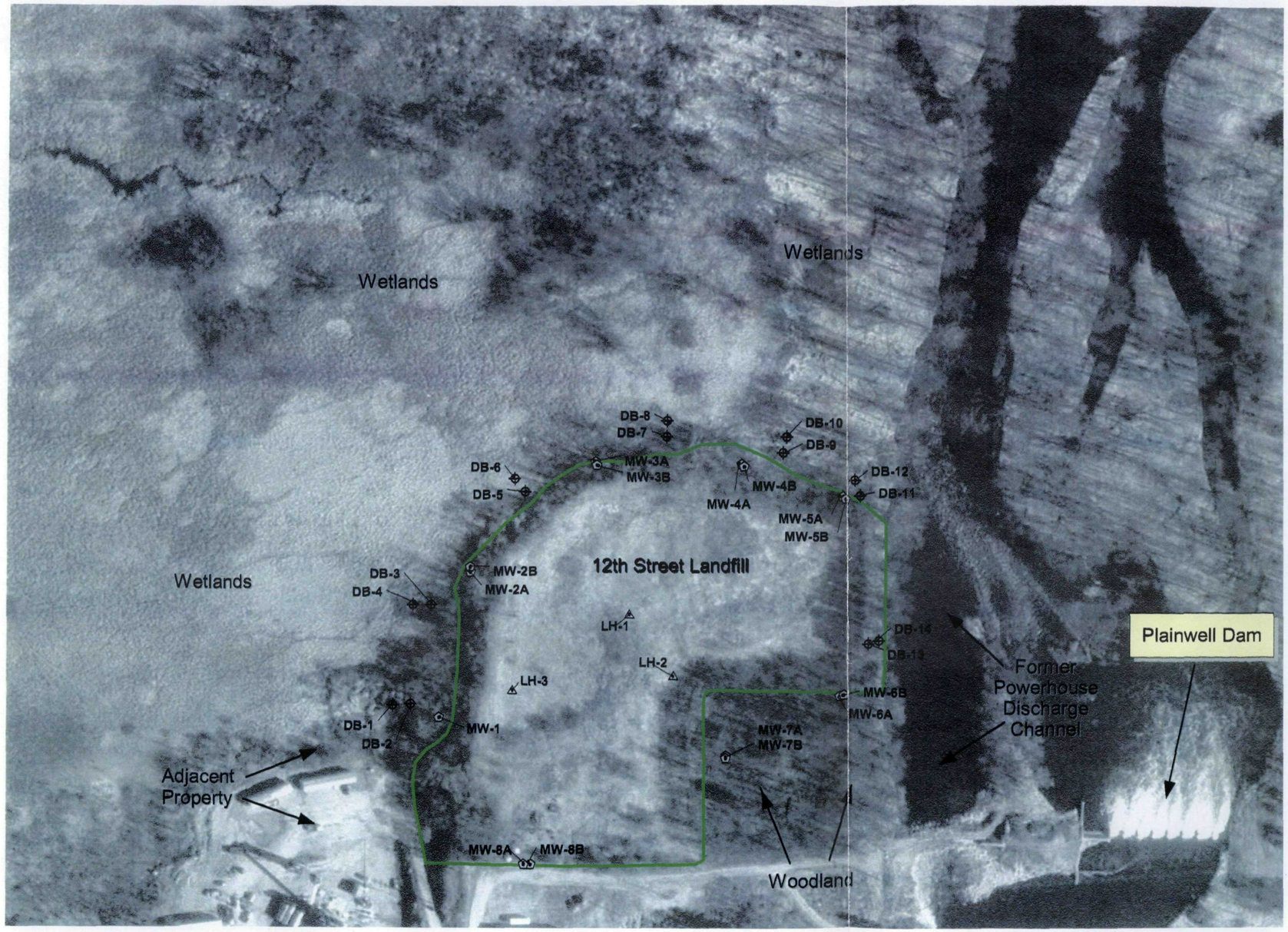
The 12th St.-OU4 is located in the middle of Section 24, Township 1N, Range 12W, approximately 1.5-miles northwest of the city of Plainwell in Allegan County, Michigan, and 0.5-miles northeast of the Highway M-89 and 12th Street intersection (Figure 1). The 12th Street Landfill (landfill) is approximately 6.5 acres, and is bordered to the east by the former powerhouse discharge channel of the Plainwell Dam on the Kalamazoo River, to the north and northwest by wetlands, to the southeast by woodlands, and to the west by a gravel mining operation.

The areas that comprise the 12th St.-OU4 and that will be addressed by this ROD are shown on Figure 2 and listed below:

- The landfill itself, which primarily contains PCB-contaminated paper residuals (residuals), and from which PCB contamination has migrated into the surrounding areas.
- Groundwater contamination and any PCB-contaminated landfill leachate.
- The woodland located immediately south/southeast of the landfill.
- Wetlands, as identified by National Wetland Inventory maps, that border the landfill to the north and northwest.

Site Location Map

FIGURE 1: Site Location Map



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Legend

Boundary Classifications

12th Street Landfill

DB-1 (Delineation Boring)

MW-1 (Monitoring Well)

LH-1 (Leachate Well)

0 100 200 300 400 Feet

Notes:
(1) Aerial photographs taken by Air Land Surveys, Inc. on 4/24/00.
(2) Coordinates are in State Plane Michigan South NAD 1983.
(3) Coordinates for Delineation Borings (DB-), Monitoring Wells (MW-), and Leachate Wells (LH-) were provided by Blasland, Bouck & Lee.

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Allied Paper, Inc./Portage Creek/ Kalamazoo River Superfund Site

12th Street Landfill Operable Unit

Figure No. 2

- A portion of the adjacent gravel operation property (adjacent property) that borders the landfill to the west.

- A portion of the former powerhouse discharge channel of the Plainwell Dam on the Kalamazoo River, which contains residuals that have eroded from the east side of the landfill.

The 12th St.-OU4 is one of the major source areas of the Site. The landfill contains PCB-contaminated residuals, which have migrated into surrounding soils and river sediments. The landfill is a current, and potentially continuing, source of PCBs to the Kalamazoo River, its associated floodplains and wetlands, and to Lake Michigan. The remedial investigation (RI) for the 12th St.-OU4, together with other investigative documents prepared for the Site, have established that PCBs migrate from the 12th St.-OU4 into adjacent properties and, ultimately, off-site due to erosion. This migration of PCBs contributes to the ongoing contamination of the soils, sediments, surface water, and biota of the Site and Lake Michigan.

The Kalamazoo River and Portage Creek have been designated a site of environmental contamination under Part 201, Environmental Remediation, of the Natural Resources and Environmental Protection Act, 1994 PA 451, as amended (NREPA), due to PCB contamination. The Kalamazoo River and Portage Creek have been identified as an Area of Concern by the International Joint Commission on the Great Lakes due to the detrimental impact the release of PCBs has on Lake Michigan. Because of widespread PCB contamination, the Site was placed on the National Priorities List (NPL) in August 1990 in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act, 1980 PL 96-510 (CERCLA). In addition, due to the PCB contamination, the Michigan Department of Community Health has issued a fish consumption advisory annually since 1977 for reaches of the Kalamazoo River and Portage Creek, including the reach of the Kalamazoo River adjacent to the 12th St.-OU4.

The landfill, woodland, wetlands, adjacent property, and the former powerhouse discharge channel of the Kalamazoo River provide habitat for numerous important fish, aquatic, and terrestrial species. Species of special concern at the Site, including the 12th St.-OU4, include mink and eagles, due to their sensitivity to PCB contamination.

The river reach next to the 12th St.-OU4 is an important natural resource for southwest Michigan, providing recreational opportunities such as fishing, hunting,

trapping, bird watching, boating, and swimming. The public enjoys recreational opportunities such as hiking and biking along extensive trail systems. Residents and visitors to the area also enjoy wetland and woodland habitats that support numerous species of plants, birds, reptiles, amphibians, and mammals.

B. SITE HISTORY AND ENFORCEMENT ACTIVITIES

PCBs are a hazardous substance and probable human carcinogen. The landfill contains an estimated 208,000 cubic yards of PCB-contaminated residuals, consisting predominantly of mineral matter in the form of gray clay. The PCB waste was generated at the Plainwell Paper Mill and disposed of by the past owners and operators of the mill in a low lying wetland area, which is now the landfill. From 1955 to 1981, the landfill was used for disposal of residuals from the paper mill.

Once the PCB-contaminated residuals were dumped, they could flow unrestricted out into the woodland, wetlands, adjacent property, former powerhouse discharge channel, and the Kalamazoo River. RI activities and site reconnaissance indicate that this waste entered the former powerhouse discharge channel, wetlands, woodland, and the adjacent property to the west. Historical photography does not show any evidence of containment.

In 1970 the Michigan Department of Environmental Quality (MDEQ) conducted a routine surface water and biota sampling at the mouth of the Kalamazoo River. The results of this investigation indicated that PCBs in the river were being discharged into Lake Michigan. A biological survey conducted by the MDEQ in 1971, pursuant to a federal Water Pollution Control Act (WPCA) program to monitor tributaries of Lake Michigan, confirmed that PCBs in the Kalamazoo River were discharging to Lake Michigan and were bioavailable.

PCBs are an oily liquid, clear to light yellow in color, and have no smell or taste. PCBs are a hazardous substance, are carcinogenic in animals, and a probable human carcinogen. Characteristics of PCBs that cause them to be especially persistent in the environment are that they bind strongly to soils, do not dissolve well in water, are not easily broken down, and are lipophilic and therefore have an affinity for the fatty tissue of biota. These characteristics cause PCBs to bioaccumulate.

A search conducted in 1990 identified three PRPs for the PCB contamination: H.M. Holdings, Inc. (now known as Millennium Holdings, Inc./Allied Paper, Inc.), Georgia-Pacific Corporation, and Simpson Plainwell Paper Company (now known as Plainwell Paper, Inc.). These PRPs were notified of their status as potentially liable parties on June 23, 1990. In 1994, the James River Corporation

(now known as Fort James Corporation) was added as a PRP. These four parties have been identified as PRPs due to past paper mill operations involving the recycling and deinking of office waste paper that included carbonless copy paper during the period from 1957 to at least 1971. During this time PCB-contaminated paper residuals were discharged directly to Portage Creek and the Kalamazoo River. The PRPs also disposed of large quantities of PCB-contaminated paper residuals in five disposal areas and several lagoons that subsequently released the residuals to Portage Creek and the Kalamazoo River.

On December 28, 1990, the PRPs signed an Administrative Order by Consent (AOC) with the state of Michigan and agreed to fund and conduct the RI/Feasibility Study (FS) for the Site, including the 12th St.-OU4. The RI/FS for the 12th St.-OU4 was initiated in July 1993, and completed in July 1997. The RI/FS reports, as well as all other appropriate data and materials, have been placed in the Administrative Record.

The Michigan Paper Company originally founded the Plainwell Paper Mill in 1886. Hamilton Paper purchased the mill in 1956 and named it the Michigan Division. Weyerhaeuser acquired the company in 1961 and operated the mill through the 1960s. Nicolet Paper Company was the owner from 1971-1975, and the mill became known as the Plainwell Paper Company. The mill retained the name Plainwell Paper Company under ownership by Philip Morris, Inc. and Philip Morris Industrial, Inc. from 1975 through 1984. The mill was then purchased by the Chesapeake Corporation in 1985. In late 1987, Simpson Paper Company purchased the mill and it became the Simpson Plainwell Paper Company. In 1998, the Simpson Plainwell Paper Company was merged into Plainwell Paper, Inc.

C. COMMUNITY PARTICIPATION

The Responsiveness Summary in Section II discusses the involvement of the community during the 12th St.-OU4 RI/FS and remedy selection process. As lead agency through the RI/FS process, the MDEQ has made every effort to ensure that the public, including the PRPs, have been afforded the opportunity to participate in the creation of the Administrative Record supporting this decision for the 12th St.-OU4, in a manner consistent with Sections 113 (k)(2)(B)(i)-(v), and 117 of the CERCLA. Attachment 1 is a brief synopsis of the community relation activities conducted by the MDEQ for this 12th St.-OU4.

D. SCOPE AND ROLE OF THE 12th St.-OU4 WITHIN THE SITE STRATEGY

The purpose of this ROD is to select the Remedial Action (RA) for the 12th St.-OU4. The selection of remedies for the other OUs, including Portage Creek and the Kalamazoo River, will be addressed in RODs specific to those areas.

The selected remedy for 12th St.-OU4 is a source control remedy that relocates residual material from the areas outside the landfill back into the landfill, and contains the PCB-contaminated material within the landfill by constructing a cap and containment system. The RA will include wetland mitigation and restoration of all excavated areas or areas otherwise affected by the RA activities. The cap and containment system of the landfill will be considered a final action. Post excavation sampling will be conducted in the excavated areas outside the landfill in accordance with an approved workplan. A final decision on whether additional response actions are necessary for the areas outside the landfill that are part of this RA will be made as part of the ROD for the Phase I portion of the Kalamazoo River (Morrow Pond Dam downstream to Lake Allegan, including Portage Creek). The remedy for the landfill proper will prevent the future release of PCBs to surface water, sediments, and the area surrounding the landfill.

The remedy does not include treatment that would reduce toxicity, mobility, or volume as a principal element. A highly significant reduction in the mobility of PCB-contaminated material will be achieved, however, by means of source containment. Although incineration was evaluated as a treatment option for these types of wastes as part of the King Highway Landfill Operable Unit 3 (KHL-OU3) remedy selection, the volume of the waste, implementation time, technical and administrative difficulties associated with implementation and cost made such a remedial approach prohibitive. Available information on landfill operations at the Site indicate, moreover, that it would not be feasible to locate and separately address concentrated areas of PCBs (hot spots) within the landfill because PCBs appear to be widespread throughout the landfill. Therefore, alternatives were not formally evaluated for identification and treatment or removal of hot spots. As required by the National Oil and Hazardous Substances Pollution Contingency Plan (NCP), a periodic (five-year) review of the remedy effectiveness will be performed.

E. SUMMARY OF 12th St.-OU4 CHARACTERISTICS

Land use in the immediate vicinity of the 12th St.-OU4 is generally characterized as industrial, with residential dwellings present beyond the nearby gravel pits and asphalt recycling/cement facilities that constitute the adjacent industrial use to the south and southwest. Extensive wetlands are present north and northwest of the OU, and the Kalamazoo River and Plainwell Dam are located to the east and

southeast. Access to the landfill is not reliably restricted. Fencing is present along the south side of the landfill only.

Based upon the information available to the MDEQ, the landfill portion of the 12th St.-OU4 is comprised mostly of paper residuals, with some concrete rubble and construction debris, waste lumber, and corroded steel drums. The presence of PCBs at the 12th St.-OU4 is a direct result of waste treatment systems operated at the Plainwell Paper Mill. The PCBs are associated with fine, gray, kaolinite clays that compose the bulk of the paper residuals that were disposed of in the landfill between 1955 and 1981.

The presence of PCB-contaminated residuals, soils, and sediments in areas outside the landfill is due to past or ongoing releases from the landfill. The sides of the landfill contain PCB-contaminated residuals that continue to be eroded into the woodland, wetlands, adjacent property, the former powerhouse discharge channel, and the Kalamazoo River. The possibility of catastrophic failure of any of the sides of the landfill is considered to be an additional potential release.

The cover on the landfill consists of sand, soil, and fly ash and ranges from between two and seven feet thick. This cover was applied only to the top of the landfill, and residual material on the sides remain exposed and have been and are being eroded into areas outside the landfill. The maximum thickness of the residuals within the landfill at the locations sampled is approximately 28 feet. There is perched PCB-contaminated leachate present in the landfill, due to the relatively low permeability of the residuals.

The upper portion of the surficial aquifer consists of sand and gravel, which is typical for this area. Geologic information, groundwater elevations, and stream stage elevations indicate that there is a hydraulic connection between shallow groundwater and the river. Plainwell Dam was found to have an influence on groundwater flow, particularly in the southeast portion of the Site.

Analytical Results:

In total, 62 residual/soil samples were collected within the landfill from a total of 16 test pits, six soil borings, and a buried steel drum, and analyzed for PCBs, volatile organic compounds (VOC's), semi-volatile organic compounds (SVOC's), inorganic compounds, pesticides, and dioxins and furans. Elevated concentrations of PCB's were detected in 31 samples, with a maximum concentration of 140 milligrams per kilogram (mg/Kg). Numerous inorganic compounds and pesticides were detected in several samples above applicable cleanup criteria, whereas benzene, toluene, ethylbenzene, xylene isomers, and

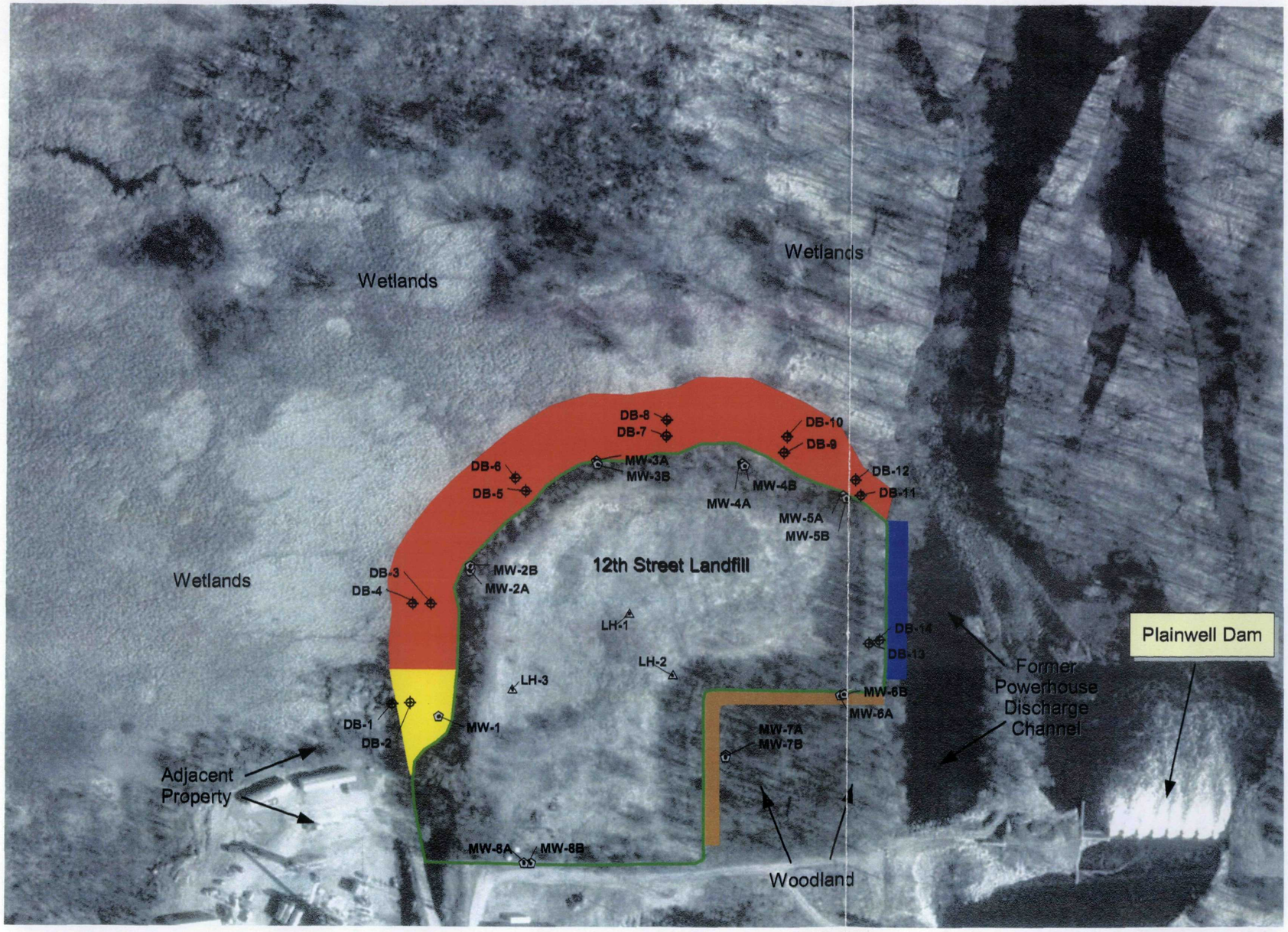
pentachlorophenol were detected above industrial and commercial cleanup criteria in isolated instances. Dioxins and furans were detected in each of the three samples analyzed for these parameters. Total toxic equivalency (TEQ) concentrations of dioxins and furans ranged from approximately 141 nanograms per kilogram (ng/Kg) to 2,241 ng/Kg. The maximum TEQ for dioxin detected (2,241 ng/Kg) exceeds state of Michigan Residential, Commercial I, Commercial II, Commercial III, and Industrial Criteria.

Soil/residual samples were collected from soil and monitor well borings that were conducted outside the landfill perimeter, and from two sediment cores collected in the former powerhouse discharge channel immediately adjacent to the east side of the landfill. Elevated PCB concentrations were reported in 24 of the 45 samples analyzed, including both samples collected from the former powerhouse discharge channel, with a maximum concentration of 158 mg/Kg. Elevated concentrations of inorganic compounds were also detected in several samples at levels exceeding applicable criteria. Trace concentrations of VOC's, SVOC's, and pesticides were also reported.

Attachments 2 and 3 include analytical data tables from Technical Memorandum 8 and the RI report that summarizes the soil/residual sample results. Figure 3 depicts the sample locations, with the exception of the sediment samples that were collected in the former powerhouse discharge channel at a location approximately 25 feet northeast of DB-14. Figure 3 also illustrates the approximate extent of visible paper residuals that are contiguous with the landfill.

In 1993, groundwater samples were collected from 15 monitor wells and analyzed for VOC's, SVOC's, inorganic compounds, pesticides, and PCB's. PCB's were not detected and all other results were either non-detect or below Industrial and Commercial Drinking Water Criteria and Groundwater Surface Water Interface (GSI) Criteria, with the exception of bis(2-Ethylhexyl) phthalate, which was detected in groundwater at a concentration of 290 micrograms per liter (ug/L). In 1995, a second round of groundwater samples was collected from each monitor well. Groundwater analyses was limited to PCB's only, and results indicated non-detectable concentrations.

Three leachate wells were sampled in 1993 and again in 1995. Analytical results from the 1993 sampling event indicate that trace concentrations of various VOC's, SVOC's, and Aldrin were present as well as an elevated concentration of toluene (680 ug/L) in leachate collected from LH-2. The toluene concentration exceeds GSI Criteria. In 1995 leachate samples were analyzed only for PCB's. Results indicate that leachate collected from leachate well LH-1 had PCB concentrations of 1.4 ug/L.



N

Legend

- DB-1 (Delineation Boring)
- MW-1 (Monitoring Well)
- LH-1 (Leachate Well)

Boundary Classifications

- 12th Street Landfill

Estimated Extent of PCB Contamination

- Wetlands
- Adjacent Property
- Former Powerhouse Discharge Channel
- Woodland

0 100 200 300 400 Feet

Notes:
(1) Aerial photographs taken by Air Land Surveys, Inc. on 4/24/00.
(2) Coordinates are in State Plane Michigan South NAD 1983.
(3) Coordinates for Delineation Borings (DB-), Monitoring Wells (MW-), and Leachate Wells (LH-) were provided by Blasland, Bouck & Lee.
(4) Extent of PCB contamination is estimated based on analytical data and onsite obeservations.

\\Detsvr\DETL007779\c:\proj\28963\OU4_gis\dischargechannel.apr

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Allied Paper, Inc./Portage Creek/ Kalamazoo River Superfund Site

12th Street Landfill Operable Unit Extent of Visual PCB Contamination

Figure No. 3

F. SUMMARY OF SITE RISKS

In 1994, a baseline risk assessment was conducted for the KHL-OU3, another OU in the Site, to evaluate risks to human health under unremediated conditions. Due to the similarities between the KHL-OU3 and the 12th St.-OU4, such as similar waste (i.e., PCB-contaminated residuals generated from the same paper recycling process at similar concentrations), identical routes of exposure, and identical receptors, it was assumed that there was a similar level of unacceptable risk at the 12th St.-OU4. Consequently, an OU-specific risk assessment was not conducted for 12th St.-OU4.

A Site-wide Baseline Ecological Risk Assessment (BERA) was however, completed in June 1999 (subsequently amended in August 2000). Although the BERA is currently being revised by the MDEQ and the United States Environmental Protection Agency (U.S. EPA), results of the BERA continue to indicate that PCB concentrations in surface water, in-stream sediments, and floodplain sediments that can erode into an aquatic environment and which are present at the 12th St.-OU4, exceed threshold levels that are protective of ecological health. A Human Health Risk Assessment (HHRA) that is currently being completed also indicates that there is an unacceptable risk for ingestion of biota from the Kalamazoo River. Listed below is a summary of risks.

1. Human Health Risks

Based on the setting of the 12th St.-OU4 and the known existing conditions, PCBs are the primary threat. Possible exposure pathways include incidental ingestion and dermal contact with surface soil, sediment, and residuals by on-site workers, trespassers and anglers; inhalation of airborne particulates by on-site workers; and, ingestion of fish.

As previously explained, the King Highway Landfill Risk Assessment was used to estimate the risks associated with incidental ingestion, dermal contact, and inhalation exposure scenarios. The HHRA being completed summarizes the human health risks. PCB concentrations detected at the 12th St.-OU4 exceed the threshold levels identified in the HHRA, and exceeds applicable criteria outlined in the NREPA.

2. Environmental Risks

The primary habitat in the vicinity of the 12th St.-OU4 is the Kalamazoo River and associated extensive wetlands and the woodland. The landfill sides, upslope from the Kalamazoo River, are part of the ecosystem encompassed

by the Kalamazoo River, woodland, and wetlands. There are no barriers to prevent fauna movement to the landfill, woodland, wetlands, adjacent property, or river that have been impacted by PCB releases from the landfill, all of which provide habitat for terrestrial and aquatic species.

The aquatic flora and fauna in the vicinity of the 12th St.-OU4 are typical of the area. Most aquatic wildlife species are generally associated with the adjacent river and wetlands. The aquatic habitat of the river and wetlands adjacent to the landfill provide support for development of various life stages of fish, turtles, and amphibians.

Terrestrial wildlife species which inhabit the 12th St.-OU4 include small mammals (e.g., mice, squirrels, woodchucks, mink, raccoons, fox, and muskrats) and birds, especially passerines and waterfowl. The Kalamazoo area is part of a major migratory flyway route for waterfowl species, and the area surrounding the 12th St.-OU4 is a migratory stopover that attracts and supports waterfowl. During nesting season, vegetation in the area provides cover and materials for nesting. Larger mammals, such as white-tailed deer, also use the 12th St.-OU4 as indicated by the deer paths running over the top and along the sides of the landfill. Muskrat dens have been observed in the wetlands and there is evidence of extensive burrowing into the sides of the landfill by fox and woodchuck.

There is no federally listed endangered or threatened species known to reside within the 12th St.-OU4. Because the 12th St.-OU4 is one of several sources of PCBs to the rest of the Site, it is important to consider the federally listed endangered or threatened species that inhabit the entire Site. The federally-listed endangered or threatened species known to reside within the Site are two turtle species that are considered scarce, one snake species that is considered endangered, bald eagles that are considered a threatened species, and four threatened and one scarce plant species.

Total PCB concentrations that were detected at the 12th St.-OU4 in surface water and sediment exceed the state Surface Water Quality Division standards for protection of avian and mammalian wildlife.

Environmental risks associated with exposure to PCBs from the 12th St.-OU4 are listed below.

- Sensitive aquatic biota such as invertebrates and fish, are likely to be adversely affected both directly (direct contact) and indirectly (food chain) by PCBs in surface water and sediment. These effects include mortality, reproductive effects (i.e., failure),

decreased populations, and growth retardation for sensitive species.

- PCB contamination of surface water and sediment affects sensitive piscivorous predators, such as mink, through consumption of PCB-contaminated prey. Impaired reproduction of mink and, ultimately, decreases in mink populations are the observed effects of PCB contamination in aquatic prey.

- Other less sensitive piscivorous predators, such as bald eagles, are at risk if fish are consumed and if foraging takes place mostly within contaminated aquatic areas. Bald eagles have successfully nested only three times since 1990 at the Site, producing a total of only five young. This success rate is well below what the U. S. Fish and Wildlife Service considers either a stable or healthy population.

- Terrestrial and semi-aquatic biota are at risk from PCB-contaminated sediment and soil, depending on life history (e.g., foraging behavior, diet, mobility) and sensitivity to PCBs.

- Carnivorous terrestrial species are likely to be at significant risk if foraging is concentrated in riparian areas with PCB-contaminated soil or sediment, and diet consists of prey that reside in PCB-contaminated areas.

- Omnivorous terrestrial species, represented by mice, appear to have moderate potential for risk from PCB-contaminated soil and sediment. These risks would be location-dependent, and would be influenced by diet, season, mobility of consumers, and by the level of contamination in food items.

- Omnivorous birds that consume a substantial amount of vegetation, represented by the robin, may be at risk if consumed terrestrial plants are taken from highly contaminated areas. Consumption of terrestrial invertebrates such as earthworms is also expected to contribute to total PCB intake.

- Semi-aquatic herbivorous mammals, represented by muskrat, are at risk from PCB contamination because estimated dietary doses exceed recommended threshold values for rats. Muskrats contaminated with PCBs also cause adverse effects to muskrat predators such as mink.

In summary, due to the human health and ecological risks associated with the 12th St.-OU4, the objectives of the RA must address the following risks:

- Human health risks for persons who trespass or work on the 12th St.-OU4.
- Human health and ecological risks due to past migration of PCB from the landfill to the woodland, wetlands, adjacent property, former powerhouse discharge channel, and the Kalamazoo River.
- Human health and ecological risks due to the continuing release of PCB from the landfill to the woodland, wetlands, adjacent property, former powerhouse discharge channel, and the Kalamazoo River.
- Human health and ecological risks due to the potential additional release of PCB to the woodland, wetlands, adjacent property, former powerhouse discharge channel, and the Kalamazoo River caused by failure of the sides of the landfill.

G. DESCRIPTION OF ALTERNATIVES

The MDEQ has relied on the information and analysis contained in the Administrative Record for 12th St.-OU4 and KHL-OU3. General similarities between the KHL-OU3 and this 12th St.-OU4 justifies such an approach. Both landfills contain large quantities of the same type of contaminated paper-making residuals. The type and concentration of PCB contamination is similar for both landfills. The same paper making process (the recycling of carbonless copy paper) led to the generation of the residuals at both locations, and both landfills accepted residuals during approximately the same time period. Finally, each landfill is located adjacent to the Kalamazoo River.

The screening of the alternatives for KHL-OU3 was determined to be applicable to the 12th St.-OU4. During the KHL-OU3 RI/FS, a total of seven potentially applicable technologies that incorporated 60 different process options were screened with respect to technical implementability. Based upon this screening, three potentially applicable technology types, as well as the No Action alternative, were carried forward in the remedy selection process for the KHL-OU3. Based on the analysis in the KHL-OU3 FS evaluation, the MDEQ determined that consolidating the PCB-contaminated material from outside the landfill back into the landfill, and capping and closing the landfill in accordance with Part 115, Solid Waste Management, of the NREPA standards and as specified in this ROD, was protective of human health and the environment.

Based on the information contained in the Administrative Records for both KHL-OU3 and this 12th St. OU4, the MDEQ has formally evaluated the following two alternatives for purposes of this ROD:

Alternative 1: No Action
Development of the No Action alternative is required under the NCP (40 Code of Federal Regulations (CFR) 300.430). It was evaluated as required by the NCP to provide a baseline for comparison of the effectiveness of the remedial alternatives. Under the No Action alternative, no active response measures would occur, and therefore, no risk reduction would result from the No Action alternative.

Alternative 2: Landfill Closure (excavation, containment, and capping in accordance with Part 115, Solid Waste Management, and Part 201, Environmental Remediation, of the NREPA, and restoration of areas affected by the RA). Alternative 2 provides for relocating residual material that has eroded from the four areas outside the landfill back into the landfill, closure of the landfill in accordance with certain requirements of Part 115, Solid Waste Management, and Part 201, Environmental Remediation, of the NREPA, restoration of areas impacted by the remedial activities, and other requirements which the MDEQ, in consultation with the U.S. EPA, has determined to be necessary to ensure long-term protectiveness of human health and the environment. Closure of the landfill involves: (1) visual identification by the lead agency of PCB containing material and excavation of that material; (2) installing a landfill cap including a flexible membrane liner (FML); (3) construction of a new sidewall containment system (SWCS) with sufficient erosion protection to prevent berm failure under 500 year flood conditions; (4) location of the SWCS at such a distance from the Kalamazoo River/former powerhouse discharge channel to ensure that there can be no hydraulic connection between the Kalamazoo River/former powerhouse discharge channel and the wastes within the landfill during the lifetime of the remedy; and (5) restoration of all areas excavated or otherwise affected by the RA. In addition, this alternative requires long-term groundwater monitoring to verify the effectiveness of the containment system and an evaluation during remedial design (RD) to determine if methane or leachate production is occurring. If the RD analysis indicates that methane or hazardous leachate is present or likely to occur after construction of the landfill cap, then this alternative will include the installation of a gas venting system and/or a leachate collection system. Wetland mitigation and restoration of excavated areas or areas otherwise affected by the RA activities will also be conducted in accordance with an approved plan. Finally, institutional controls such as deed restrictions, fencing, and sign posting shall be utilized to reduce potential human exposure to soil, residuals, and other media.

The 1997 FS identified capital costs of $1,655,040 associated with implementing Alternative 2, and annual operation and maintenance (O&M) costs of $14,000, resulting in a present worth cost of $1,828,800, based on 1997 dollars. Data indicates that residual material has continued to erode from the landfill since the RI/FS data was collected, and consequently, the volume of residuals in the areas outside the landfill is now approximately 4,000 cubic yards. Consequently, the impacted area is larger than presented in the 1997 FS and costs for clearing and grubbing and excavating the additional area, and wetland mitigation and restoration of affected areas now reflect the larger area. In addition, costs associated with post-excavation sampling to identify the concentration of any remaining PCBs, and some O&M were inadvertently excluded from the 1997 FS. With the aforementioned additional expenses, revised capital costs are $1,769,238, and O&M costs are $434,967, resulting in total costs of $2,204,205 (approximately a 20 percent overall increase from 1997).

Attachment 4 summarizes the costs.

Capital costs consist of direct costs (e.g., construction, equipment, transportation, disposal, analytical, treatment, and contingency) and indirect costs (e.g., engineering, legal, and permitting fees) incurred by implementing a specific alternative. O&M costs refer to long-term, post-construction measures necessary to ensure continued effectiveness of the RA. The O&M costs were developed for the first year of system operation and the 30-year present worth cost analysis. Total net present worth cost is intended to represent the sum of money, if invested in the base year and disbursed as needed, that would be sufficient to cover costs of a remedy over its planned life (assumed to be 30 years for comparison purposes).

This alternative is estimated to take approximately one year to reach construction completion.

H. SUMMARY OF COMPARATIVE ANALYSIS OF ALTERNATIVES

In accordance with the NCP, the relative performance of each alternative is evaluated using the nine criteria (Section 300.430 (e)(9)(iii)) of the NCP as a basis for comparison. The purpose of the evaluation process is to determine which alternative: (a) meets the threshold criteria of overall protection of human health and the environment and attainment of Applicable or Relevant and Appropriate Requirements (ARARs), (b) provides the "best balance" with respect to the five balancing criteria of 40 CFR § 300.430(e)(9)(iii)(C)-(G), and (c) takes into consideration the acceptance of the support agency (here, the U.S. EPA) and the community.

As noted above, the MDEQ relied on the comparative analysis performed in connection with the KHL-OU3 to reach a remedy decision for this 12th St.-OU4. A formal analysis under the NCP of alternatives in this decision document would result in the same conclusion as those for the KHL-OU3 FS and ROD, and therefore was not conducted in order to prevent a duplication of effort.

1. Threshold Criteria

   a. **Overall Protection of Human Health and the Environment** addresses whether a remedy provides adequate protection of human health and the environment and describes how risks posed through each exposure pathway are eliminated, reduced, or controlled through treatment, engineering, or institutional controls. The selected remedy must meet this criterion.

   The major exposure pathways of concern at the 12th St.-OU4 are ingestion, inhalation, and dermal contact with PCB-contaminated soils, sediments, or residuals in the landfill or in the areas outside the landfill; dermal contact with PCB-contaminated surface water; and ingestion of fish.

   Alternative 2 would provide adequate protection of human health and the environment by controlling the mobility of contaminants through engineering and institutional controls. A cap would serve as a barrier to human and wildlife contact with the residuals. An adequate cap would also decrease the rate of precipitation infiltration, thereby reducing the likelihood of formation of new leachate and the potential for PCBs to migrate into groundwater. Construction of new berms would prevent release of PCBs due to side failure. Excavation using visual criteria to remove residuals from the landfill sides, woodland, wetlands, adjacent property, and in a portion of the former powerhouse discharge channel, and relocating the residuals back into the landfill prior to the construction of the cap, will reduce the potential for exposure and migration of PCBs into the environment. A buffer zone will be established between the toe of the newly constructed berm and the former powerhouse discharge channel in order to ensure that, for the lifetime of the remedy, no hydraulic connection exists between the landfill and the Kalamazoo River/former powerhouse discharge channel.

   The No Action alternative does not provide adequate protection because it does not address the existing unacceptable human health and ecological risks associated with the 12th St.-OU4.

b. **Compliance with ARARs** addresses whether a remedy meets ARARs set forth in federal and state environmental laws and/or justifies a waiver from such requirements.

ARARs for this RA include the following:

- Surface water quality standards contained in Part 31, Water Resources Protection, of the NREPA.

- Rules established pursuant to Part 31, Water Resources Protection, of the NREPA regarding permit requirements.

- Site-specific pollutant limitations and performance standards which are designed to protect surface water quality contained in the federal Clean Water Act (CWA).

- Regulations prohibiting unauthorized obstruction or alteration of any navigable water in the United States (dredging, fill, cofferdams, piers, etc.) contained in the federal River and Harbor Act.

- Regulations regarding the dredging or filling of lakes or stream bottoms contained in Part 301, Inland Lakes and Streams, of the NREPA.

- Rules prescribing soil erosion and sedimentation control plans, procedures, and measures contained in Part 91, Soil Erosion and Sedimentation Control, of the NREPA.

- Rules prohibiting the emissions of air contaminants in quantities which cause injurious effects to human health, animal life, plant life of significant economic value, and/or property contained in Part 55, Air Pollution Control, of the NREPA.

- National ambient air quality standards contained in the federal Clean Air Act.

- Statutory provisions and rules specifying environmental response, risk assessment, RA, and site cleanup criteria pursuant to Part 201, Environmental Remediation, of the NREPA.

- Certain regulations regarding the construction, operation, and closure of sanitary landfills, solid waste transfer facilities, and solid waste processing plants pursuant to Part 115, Solid Waste Management, of the NREPA.

- Effluent standards for toxic compounds including PCBs contained in the federal WPCA Toxic Pollutant Effluent Standards.

- Regulations regarding activities in wetlands found in Part 303, Wetland Protection, of the NREPA.

- Federal regulations under the Toxic Substances Control Act (TSCA) regarding the risk-based disposal of PCB remediation waste, 40 CFR § 761.61(c).

Requirements of the above ARARs will be met by Alternative 2.

The No Action alternative does not meet the ARARs.

2. Primary Balancing Criteria

c. **Long-term Effectiveness and Permanence** refers to expected residual risk and the ability of a remedy to maintain reliable protection of human health and the environment over time once cleanup goals have been met.

Alternative 2 would provide long-term effectiveness via isolation of the residuals by capping and containment. The RA for the landfill will be considered a final action. Long-term O&M and monitoring of the landfill must be provided to ensure that the remedy maintains its ability to protect human health and the environment over time. A final decision on whether additional response actions are necessary for the areas outside the landfill that are part of this RA will be made as part of the ROD for the Phase I portion of the Kalamazoo River.

The No Action alternative does not meet the long-term effectiveness and permanence criteria.

d. **Reduction of Toxicity, Mobility, or Volume Through Treatment** addresses the statutory preference for selection of RA that employ treatment technologies that permanently and significantly reduce toxicity, mobility, or volume through treatment of the hazardous substance as a principal element.

As detailed above, the stated programmatic goal of the U.S. EPA, as expressed in the NCP, is to select remedies that are protective over time and "minimize untreated waste", Section 300.430 (a)(1)(i). The NCP states that the U.S. EPA will use "treatment to address the principal threats at a site, wherever practicable", Section 300.430 (a)(l)(iii)(A). This preference is

satisfied when treatment is used to reduce the principal threats at a site through destruction of toxic contaminants, reduction of total mass of toxic contaminants, irreversible reduction in contaminant mobility, or reduction of total volume of contaminated media.

Alternative 2 would not result in the reduction in the toxicity, mobility, or volume of contaminants through treatment. The employment of treatment technologies at this OU was not found to be practicable. Alternative 2 will, however, achieve significant reductions of the mobility of the contaminants at this OU through containment, and this reduction in mobility will endure for as long as the integrity of the containment system is maintained.

The No Action alternative does not reduce toxicity, volume, or mobility.

e. **Short-term Effectiveness** considers the time to reach cleanup objectives and the risks an alternative may pose to site workers, the community, and the environment during remedy implementation. This criterion also considers the reliability and effectiveness of any mitigative measures taken during remedy implementation to control those short-term risks.

It is estimated that once construction is started, Alternative 2 could be completed in approximately one year. Alternative 2 has some potential short-term negative impacts. For example, truck traffic during cap construction may increase noise and dust in the vicinity of the landfill, however, air monitoring will be required and protective controls will be implemented to suppress dust in order to comply with federal and state air quality standards. The use of erosion controls will be used to mitigate any short-term effects posed by potential siltation and contaminant release to the Kalamazoo River. Health and safety precautions will be undertaken to reduce the likelihood of accidents during construction and to protect site workers and the community from unacceptable exposures to hazardous substances. The discharge of treated water to the surface water of the Kalamazoo River or to the Kalamazoo Wastewater Treatment Plant will be in accordance with a National Pollutant Discharge Elimination System (NPDES) permit. This permit will establish discharge criteria (as administered by the state under Part 31, Water Resources Protection, of the NREPA), that are set at protective levels.

f. **Implementability** is the technical and administrative feasibility of a remedy, including the availability of materials and services needed to implement a particular option.

No significant implementation problems are projected for Alternative 2. Cap and containment system materials are expected to be obtainable from nearby

sources and standard construction methods will be used. All necessary excavation and NPDES permits, or any other required permit can be obtained from the federal or state governments. Excavation firms are available to install sheetpile and remove the residual material from the wetlands, woodland, adjacent property, and the portion of the former powerhouse discharge channel that contains residuals that have eroded from the landfill. Environmental controls will be implemented to prevent air emissions to the atmosphere or migration of PCBs to the river during excavation and cap and containment system construction.

g. **Cost** listed below in Table 1 include estimated capital and O&M costs, also expressed as net present worth. The O&M will need to be continued for the lifetime of the remedy because the remedy leaves hazardous waste at the 12th St.-OU4.

TABLE 1

Estimated Cost of Remedial Alternatives for the 12th St.-OU4

ALTERNATIVE	CAPITAL	O&M (30 YEARS)	PRESENT WORTH
1. No Action	None	None	None
2. Excavate, cap and contain, wetland mitigation	$1,769,238	$434,967	$2,204,205

3. Modifying Criteria

h. **Support Agency Acceptance** addresses whether or not the support agency agrees with, or objects to, any of the remedial alternatives.

The U.S. EPA, as the support agency for the Site, agrees that **Alternative 2** is protective of human health and the environment.

i. **Community Acceptance** addresses the public's general response to the remedial alternatives and to the Proposed Plan. Specific responses to public comments are addressed in the attached Responsiveness Summary.

I. THE SELECTED REMEDY

Based upon the evaluation of the RI/FS completed in connection with this 12th St.-OU4, the RI/FS completed in connection with the KHL-OU3, other analyses performed in connection with the Kalamazoo River OU, and the nine criteria for remedy selection contained in the NCP, the MDEQ selects Alternative 2 as the remedy for the 12th St.-OU4. The RA shall insure that unacceptable exposure to PCBs will not occur. Construction details for Alternative 2 shall be part of the RD.

1. Excavation

Prior to any excavation in the woodland, wetlands, adjacent property, or the former powerhouse discharge channel, the horizontal and vertical extent of the PCB contamination shall be determined based on field reconnaissance and/or sample analyses. The east side of the landfill, along the former powerhouse discharge channel and the river, shall also be excavated and relocated further into the landfill. The excavation shall be extensive enough to create an adequate buffer zone to ensure that, for the lifetime of the remedy, no hydraulic connection exists between the PCB-contaminated wastes within the newly constructed landfill containment system and the Kalamazoo River/former powerhouse discharge channel. This buffer zone shall take into account potential changes in the direction and current of the river's flow. This buffer zone shall be of sufficient size to allow for the installation of and access to groundwater monitoring wells and to provide for a hydraulic separation between the waste and the surface water.

An excavation work plan shall be submitted to the lead agency for review and approval prior to initiating any excavation activity. The excavation work plan shall be based on the results of the pre-excavation sampling and/or field reconnaissance and shall include air and surface water monitoring provisions. Subsequent to work plan approval, all excavated material will be dewatered as necessary and disposed of in the landfill prior to construction of the cover and containment system.

Following post-excavation sampling, a determination whether additional response actions will be necessary for the areas outside that landfill will be made as part of the ROD for the Phase I portion of the Kalamazoo River.

Short-term surface water monitoring shall be conducted during all construction activities and excavation of materials from the landfill, woodland, wetlands, adjacent property, and the former powerhouse discharge channel in accordance with an approved monitoring plan. Surface water monitoring shall be conducted in order to assure that public health, safety, welfare, and the environment are being protected in accordance with state and federal law during implementation of excavation activities.

Air monitoring may be necessary during the RA activities. This monitoring may be necessary to ensure that the RA activities do not violate the rules prohibiting the emission of air contaminants in quantities which have injurious effects on human health, animal life, plant life of significant economic value, and/or property as established in Part 55, Air Pollution Control, of the NREPA.

Upon completion, the excavated areas shall be restored to their natural condition in accordance with an approved plan. Soil erosion shall be controlled compliant with state law during remedy implementation. Restoration of the wetlands pursuant to Part 303, Wetlands Protection, of the NREPA, shall also be carried out.

2. Cap

Under Alternative 2, a cap shall be placed in the landfill portion of the 12th St.-OU4 in compliance with the appropriate requirements of Part 115, Solid Waste Management, of the NREPA concerning cap specifications for closure of a solid waste disposal facility. The construction of the cap over the landfill will minimize infiltration of precipitation through the landfill and migration of PCB from the landfill into the groundwater, woodland, wetlands, adjacent property, and the former powerhouse discharge channel. The cap consists of the following components from bottom to top.

A layer of select granular fill at least six inches thick, from an off-site source, having a minimum hydraulic conductivity of 1 x 10^{-3} centimeters per second, shall be placed on top of the landfill as a suitable sub-grade for the cap. The need for a gas venting system will be evaluated in the RD process. If it is determined that a gas venting system is needed, this layer will be modified as approved by the MDEQ to also act as a gas venting layer. If so modified, this gas venting layer shall be designed to collect landfill gas (methane) and route it to a passive venting system. If it is determined that a gas venting system is required, it shall be monitored pursuant to an approved monitoring plan to determine whether emissions may cause potential health effects. If potential

health effects are indicated, an emission treatment system shall be placed in the venting system as directed by the lead agency to reduce the emissions to acceptable levels.

A polyvinyl chloride (PVC) geomembrane liner at least 30 mils thick, or its equivalent, will be placed over the select granular fill.

A general fill (protective) layer at least 24 inches thick will be placed above the 30-mil PVC, geomembrane liner. The protective layer will be capable of sustaining the growth of non-woody plants, and shall have adequate water holding capacity. The water that accumulates within this layer will drain to a sedimentation outlet structure and discharge to the Kalamazoo River.

A vegetative (erosion) layer at least six-inches thick will be placed over the protective layer. The vegetative layer will be designed to promote vegetative growth, provide surface water runoff, and minimize erosion. The feasibility of using vegetation that would provide habitat, such as native grasses, will be addressed in the RD.

3. Erosion Protection

Erosion protection shall be placed on the newly constructed side walls of the landfill. This protection shall be sufficient to protect the side walls from a 500-year flood event. The erosion protection shall extend, at a minimum, to an elevation of 707.0 feet above mean sea level (MSL), which is approximately two feet above the 100-year flood elevation.

Placement of erosion and flood protection on the side walls of the landfill is consistent with requirements of Part 115, Solid Waste Management, Part 301, Inland Lakes and Streams, Part 91, Soil Erosion and Sedimentation Control, and Part 303, Wetlands Protection, of the NREPA.

4. Installation of Groundwater Monitoring System

Groundwater monitoring wells will be installed and wells that are no longer necessary will be properly abandoned. This groundwater monitoring system will be designed to detect any groundwater contamination from the landfill and will be developed as part of the RD in accordance with Part 201, Environmental Remediation, of the NREPA.

5. Long-Term Monitoring

Long-term groundwater monitoring shall be performed in accordance with an approved groundwater monitoring plan. The plan may require the installation of additional monitoring wells. The continued need for monitoring will be evaluated at the five-year review required under the NCP, and at each review thereafter, but shall continue until the lead agency, in consultation with the support agency, determines that such monitoring is no longer necessary. Monitoring of the groundwater aquifer under the landfill shall be conducted in accordance with Part 201, Environmental Remediation, of the NREPA.

6. Engineering Controls - Fencing

After the RA is completed, fencing shall be installed around the entire landfill portion of the 12th St.-OU4 in accordance with approved work plans.

7. Containment System

A containment system shall be constructed around the outside of the landfill. The existing sides of the landfill are constructed of sand, fly ash, and PCB-contaminated residuals. These sides were not designed to provide side slope stability, flood protection, or erosion control. The existing sides will be completely covered by the new containment system. The containment system shall be designed to prevent release of any PCB contamination. It must provide appropriate slope stability and flood and erosion protection. The containment system shall be designed, at a minimum, to meet the relevant provisions of Michigan Solid Waste Landfill closure regulations pursuant to Part 115, Solid Waste Management, of the NREPA. The containment system must be approved prior to construction.

8. Leachate Collection

During RD, an evaluation of the need for a leachate collection system shall be submitted for approval. The evaluation, at a minimum, shall consider the water content of the waste, the presence of perched water within the landfill, and the potential for and effect of waste settlement.

If it is determined that leachate collection is necessary, a leachate collection system as specified by the lead agency shall be included in the final design and it shall be operated to assure that the public health, safety and welfare, and the environment are adequately protected.

9. Posting and Permanent Marker(s)

Permanent marker(s) shall be placed at the landfill describing the restricted area of the 12th St.-OU4 and the nature of any restrictions. Warning signs will also be posted on the fence every 200 feet and on all entry gates. The number, content, and location of the permanent markers and warning signs shall be approved by the lead agency.

10. Deed Restrictions

Deed restrictions approved by the lead agency shall be placed on the landfill area property to regulate future use of the landfill to protect public health, safety and welfare, and the environment.

11. Long-term Maintenance

Long-term maintenance, post-closure care, and financial assurance as required by Part 201, Environmental Remediation, of the NREPA, shall be provided as part of this RA. A detailed O&M Plan shall be submitted as part of the RD. Once approved, long-term O&M shall be carried out pursuant to the plan.

12. Other Provisions

Measures will be taken during remedy construction activities to minimize the noise and dust impacts of construction upon the surrounding community. Fugitive dust emissions will be monitored and controlled in a manner to ensure that they comply with the standards contained in Part 55, Air Pollution Control, of the NREPA.

13. Five-Year Review

Because this remedy will result in hazardous substances remaining on-site above health-based and ecological-based levels, a review will need to be conducted within five years after commencement of the RA, and every five years thereafter. This review will be done to evaluate whether the remedy continues to provide adequate protection of human health and the environment and determine if any additional action is needed for the remedy to be protective.

J. STATUTORY DETERMINATIONS

As explained at length below, the selected remedy is consistent with the requirements of Section 121 of CERCLA to:

1. Protect human health and the environment.
2. Comply with ARARs.
3. Be cost-effective.
4. Utilize permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable.

Although the selected remedy does not satisfy the CERCLA's preference for treatment as a principal element of the remedy, such treatment was not considered necessary to ensure protectiveness at the 12 St.-OU4.

1. Protection of Human Health and the Environment

   The presence of PCBs at concentrations exceeding applicable criteria and ecological and human health based threshold values in areas outside the landfill is evidence of past and on-going releases. The possibility of failure of the sides of the landfill, especially the side between the landfill and the Kalamazoo River including the former powerhouse discharge channel, is recognized as a threatened future release of PCBs into the environment. The on-going release of PCBs to the environment is occurring from the PCB-contaminated residuals, soils, and sediments located in the landfill, woodland, wetlands, adjacent property, and the former powerhouse discharge channel. The data from the Lake Michigan Mass Balance Study indicates that at least 30 kilograms per year of PCB is being discharged from the Site into Lake Michigan. This action will reduce and control the migration of PCBs from the 12th St.-OU4.

   Following consolidation of the excavated material, the cap and containment system will provide a barrier that will control or eliminate the PCB exposure pathways, and will reduce precipitation infiltration through the residuals over time, thereby reducing the potential for additional leachate formation. The containment system will eliminate the erosion of contaminated material from the landfill. Engineering and institutional controls in the form of fencing and posting, along with deed restrictions, will further reduce the likelihood of human exposure to PCBs at the 12th St.-OU4.

No unacceptable short-term risks or cross-media impacts will be caused by implementation of the remedy. As mentioned above, mitigative measures will be taken during excavation and construction activities to minimize noise and dust, siltation and contaminant release to the Kalamazoo River and surrounding community.

2. Compliance with ARARs

The selected remedy will comply with the federal and/or state ARARs (categorized as chemical-specific, location-specific, and action-specific) listed below.

a. **Chemical-specific ARARs**
Chemical-specific ARARs regulate the release of specific substances which have certain chemical characteristics. Chemical-specific ARARs typically determine the extent of cleanup at a site.

Federal Chemical-Specific ARARs:

TSCA
TSCA's PCB Remediation Waste Rule, 40 CFR § 761.61 et seq. provides cleanup and disposal options for PCB remediation waste. PCB remediation waste is that waste containing PCBs as a result of the spill, release, or other unauthorized disposal at a concentration, for purpose of this OU, equal to or greater than 50 ppm.

The Remedial Alternative selected in this ROD provides for disposal of the PCB remediation waste at this OU by means of the risk-based disposal method provided in 40 CFR § 761.61(c). This federal regulation allows the U.S. EPA Superfund Division Director, in consultation with the TSCA program under which disposal is to occur, to make a determination that a proposed disposal method will not pose an unreasonable risk of injury to health or to the environment.

Through its request for concurrence on this ROD to the U.S. EPA Superfund Division Director, in consultation with the TSCA program, the MDEQ has applied pursuant to 40 CFR § 761.61(c)(1) for approval of the proposed disposal method, i.e. consolidation of the wastes and capping. During the RI/FS process for this 12th St.-OU4, the MDEQ has submitted to the U.S. EPA the information described in the notification required by 40 CFR § 761.61(a)(3), or its equivalent. The concurrence of the U.S. EPA Superfund Division Director, in consultation with the TSCA program,

with the remedy selected in this ROD represents the U.S. EPA's written approval, pursuant to 40 CFR § 761.61(c)(2), of the MDEQ's application, and U.S. EPA's concurrence with the MDEQ's conclusion that the method of disposal selected in this ROD will not pose an unreasonable risk of injury to health or to the environment.

The conclusion that the consolidation and capping disposal method proposed in this ROD does not pose an unreasonable risk of injury to human health or to the environment is supported by all of the data collected in the RI. As an initial matter, most of the contaminated materials that will be disposed of in the landfill are not, by definition, PCB remediation wastes because the level of PCB contamination is below 50 ppm. The contaminated residuals in the landfill have had the opportunity to naturally settle for many years. The base of the contaminated residuals will have had time to dewater and establish a dense low hydraulic conductivity zone. Tests show that the residuals are relatively impermeable. These factors should reduce the likelihood that leachate, if produced, can escape from the new landfill. In any event, soil investigations to be conducted during the RD phase of this remedy will establish whether leachate is present or will be generated by compressing the residuals. The risk of leachate release will be evaluated and, if hazardous leachate is present in quantities that should be addressed, this remedy provides for installation of a leachate collection system.

The proposed cap will ensure that terrestrial biota are no longer exposed to the PCB-contaminated wastes in the landfill. The sides and slopes of the landfill will be constructed to withstand flooding that statistically occurs only once in every 500 years. This construction standard, along with the buffer zone that will be created between the former powerhouse discharge channel and the landfill, should ensure that the aquatic biota in the Kalamazoo River are no longer exposed to PCB-contaminated materials eroding from the landfill area. In short, no significant reduction in long-term risks to human health and the environment would be achieved by disposing of these contaminated materials off-site. In fact, off-site disposal carries the potential of additional short-term risks to excavation and transportation personnel.

In summary, this remedial alternative will achieve the TSCA ARAR by implementing a risk-based disposal method. The disposal method selected in this ROD comprises: (1) consolidation of the PCB-contaminated materials into the existing landfill area; (2) the creation of a buffer zone between the former powerhouse discharge channel and the

landfill; (3) capping of the landfill in a manner that complies with all applicable Michigan requirements; and (4) if necessary, installation of a leachate collection system. This disposal method will pose no unreasonable risk to human health or the environment.

CWA - Ambient Water Quality Criteria:
This act and criteria establish monitoring requirements for the discharge of waste treatment effluents to waters of the United States. They are applicable to the surface water discharges resulting from excavation and dewatering of soils, sediments, or residuals from the former powerhouse discharge channel, wetlands, woodlands, and adjacent property.

Federal WPCA - Toxic Pollution Standards:
This act would be applicable to the discharge to the Kalamazoo River of water from all dewatering activities.

State Chemical-Specific ARARs:

Part 201, Environmental Remediation, of the NREPA provides for the identification, risk assessment, evaluation, and remediation of contaminated sites within the state; therefore, Part 201, Environmental Remediation, of the NREPA is applicable to the 12th St.-OU4. The statute and its rules provide, *inter alia*, that RAs shall be protective of human health, safety and welfare, and the environment of the state. Part 201, Environmental Remediation, of the NREPA, in particular those in Section 20120a and 20120b, specifies that a RA shall achieve a degree of protectiveness appropriate for the use of the property, in this case, the 12th St.-OU4.

Part 31, Water Resources Protection, of the NREPA establishes effluent standards in accordance with the federal WPCA and the CWA, and also establishes rules specifying standards for several water quality parameters including PCBs. Part 31, Water Resources Protection, of the NREPA, would be applicable to the discharge of water from the site to the Kalamazoo River.

b. **Location-Specific ARARs**
Location-specific ARARs are those requirements that relate to the geographical position of a site. These include:

State Location-Specific ARARs:

Part 115, Solid Waste Management, of the NREPA:
Part 115, Solid Waste Management, of the NREPA contains regulations regarding the construction, operation, and closure of sanitary landfills, solid waste transfer facilities, and solid waste processing plants.

c. **Action-Specific ARARs**

Action-Specific ARARs are requirements that define acceptable treatment and disposal procedures for hazardous substances.

Federal Action-Specific ARARs:

CWA:
The CWA establishes site-specific pollutant limitations and performance standards that are designed to protect surface water quality. Types of discharges regulated under the CWA include discharge to surface water, indirect discharge to a publicly owned treatment works (POTW), and discharge of dredge or fill materials to United States waters. This act is relevant to the treatment and discharge of water to the Kalamazoo River or POTW from the dewatering operations.

Rivers & Harbor Act:
The Rivers & Harbor Act prohibits unauthorized obstruction or alteration of any navigable water in the United States (dredging, fill, cofferdams, etc.). It also requires that federal agencies, where possible, avoid or minimize adverse impacts of federal actions upon wetlands and floodplains. Remedial activities, which may require a permit to perform, must be conducted in such a way that they will avoid unacceptable obstruction or alteration of the Kalamazoo River channel.

Clean Air Act:
The Clean Air Act establishes requirements for constituent emission rates in accordance with national ambient air quality standards. Excavation and cap construction activities will be regulated by the Clean Air Act.

TSCA:
TSCA's PCB Remediation Waste Rule, 40 CFR, Section 761.*61* provides the requirements for the disposal of PCB-contaminated wastes, and would therefore be applicable to this remedy.

State Action-Specific ARARs:

Part 91, Soil Erosion and Sedimentation Control, of the NREPA:
This part regulates earth changes, including cut and fill activities which may contribute to soil erosion and sedimentation of surface water. Part 91, Soil Erosion and Sedimentation Control, of the NREPA would apply to any such activity where more than one acre of land is affected or the regulated action occurs within 500 feet of a lake or stream. Part 91, Soil Erosion and Sedimentation Control, of the NREPA would be applicable to the cap construction activities since these actions could impact the Kalamazoo River, which is less than 500 feet from the 12th St.-OU4.

Part 301, Inland Lakes and Streams, of the NREPA:
Part 301, Inland Lakes and Streams, of the NREPA regulates the dredging or filling of lake or stream bottoms. Activities associated with the selected remedy, sediment removal, and berm stabilization are regulated under this part due to the proximity of the 12th St.-OU4 to the Kalamazoo River.

Part 115, Solid Waste Management, of the NREPA:
Part 115, Solid Waste Management, of the NREPA contains regulations regarding the construction, operation, and closure of sanitary landfills, solid waste transfer facilities, and solid waste processing plants.

Part 31, Water Resources Protection, of the NREPA:
Part 31, Water Resources Protection, of the NREPA establishes rules regarding water and wastewater discharges. This is applicable for discharge of waters to the Kalamazoo River. Part 31, Water Resources Protection, of the NREPA also includes the rules regarding permit requirements for discharges.

Part 55, Air Pollution Control, of the NREPA:
Rules prohibiting the emission of air contaminants in quantities which have injurious effects on human health, animal life, plant life of significant economic value, and/or property are established in Part 55, Air Pollution Control, of the NREPA. This would be applicable to excavation and cap construction activities. During the construction of the RA, the total emissions from the entire site shall comply with the secondary risk screening level (SRSL) for PCB. The SRSL for PCB based upon an incremental cancer risk of 1 in 100,000 is 0.02 ug/m^3 (micrograms per

cubic meter) applied at the 12th St.-OU4 perimeter. At a perimeter location where the adjacent property is an industrial property or a public roadway, Rule 225 (3)b allows for compliance with the SRSL multiplied by a factor of 10. Where the adjacent property is not an industrial property or public roadway, the perimeter location shall comply with the SRSL.

Michigan Occupational Safety and Health Act 154 (MIOSHA):
MIOSHA establishes the rules for safety standards in the work place and is applicable to the remediation activities.

Part 201, Environmental Remediation, of the NREPA:
Part 201, Environmental Remediation, of the NREPA provides for the evaluation and remediation of contaminated sites within the state. The MDEQ has determined that Part 201, Environmental Remediation, of the NREPA is applicable to the 12th St.-OU4. Part 201, Environmental Remediation, of the NREPA requires that RAs be protective of human health, safety and welfare, and the environment.

Part 303, Wetland Protection, of the NREPA:
Regulates activities conducted in wetlands as well as mitigation of wetlands.

3. Cost-Effectiveness

The selected remedy for the 12th St.-OU4 has the least cost of those remedies that provides an acceptable degree of protectiveness, compared to the other alternatives evaluated formally in this ROD and informally through analysis and comparison with the alternatives considered as part of the KHL-OU3 remedy selection process. Capital costs are the direct and indirect costs and O&M costs refer to long-term, post-construction measures necessary to ensure continued effectiveness of a RA. Total net present worth cost represents the sum of money, if invested in the base year and disbursed as needed, that would be sufficient to cover costs of a remedy over its planned life (assumed to be 30 years for comparison purposes).

Alternative 2 will be effective in the long-term due to the significant reduction of the mobility of the PCBs achieved through excavation of residuals that are contiguous with the landfill and containment of these materials with the materials in the landfill.

4. Utilization of Permanent Solutions and Alternative Treatment Technologies to the Maximum Extent Practicable

The state of Michigan has determined that the selected remedy provides the best balance in terms of long-term effectiveness and permanence, reduction of toxicity, mobility, or volume of contaminants through treatment, short-term effectiveness, implementability, and cost, taking into consideration acceptance by the U.S. EPA and the community.

The selected remedy includes excavation of residual material from the woodland, wetlands, adjacent property, and from the portion of the former powerhouse discharge channel where residuals have eroded into the channel from the landfill; relocation of these materials back into the landfill; installation and maintenance of a landfill containment system; restoration of areas affected by the RA; groundwater monitoring; gas venting and/or leachate collection systems (if necessary), and access and land use restrictions.

5. Preference for Treatment as a Principal Element

The state of Michigan believes that the selected remedy is protective of human health and the environment and utilizes permanent solutions and alternative technologies to the extent practicable. The remedy, however, does not satisfy the statutory preference for treatment of the hazardous substances present as a principal element because additional treatment of the source areas of the landfill would not be practicable and too costly as compared to ensuring the long-term containment of the hazardous substance at the site.

6. Five-Year Review Requirements

Because this remedy will result in hazardous substances, pollutants, or contaminants remaining on-site above levels that allow for unlimited use and unrestricted exposure, a statutory review will be conducted within five years after initiation of the RA to ensure that the remedy is, or will be, protective of human health and the environment.

K. SUMMARY

The selected remedy will satisfy the statutory requirements established in Section 121 of the CERCLA, as amended by the Superfund Amendments and Reauthorization Act of 1986, to protect human health and the environment. It complies with all ARARs, will provide overall effectiveness appropriate to its costs and will use permanent solutions and alternative treatment technologies to

the maximum extent practicable. Treatment is not a component of the selected remedy because an attempt to treat the PCBs in the soils, sediments, and residuals at the 12th St.-OU4 would not provide sufficient additional risk reduction in relation to increased cost.

II. RESPONSIVENESS SUMMARY

The public participation requirements of the CERCLA Sections 113 (k)(2)(i-v) and 117 have been met during the remedy selection process. Section 113 (k)(2)(i-v) and 117 of the CERCLA require the state as the lead agency to respond "to each of the significant comments, criticisms, and new data submitted in written or oral presentations" on a Proposed Plan for an RA. The Responsiveness Summary addresses the concerns expressed by the public, PRPs, and governmental bodies in written and oral comments received by the MDEQ regarding the preferred alternative for the 12th St.-OU4. The public supports the preferred alternative.

OVERVIEW

The MDEQ has established the Citizens Advisory Committee (CAC) and the Government Advisory Committee (GAC) to enhance public participation. The CAC is comprised of local residents and the GAC is comprised of all interested elected officials from local, state, and federal governments. A list of meeting dates, attendees, and topics discussed at each meeting concerning the 12th St.-OU4 can be found in Attachment 1 of this ROD.

At the time of the public comment period, the MDEQ as lead agency, in consultation with the U.S. EPA, the support agency, had proposed a preferred alternative for the 12th St.-OU4. The preferred alternative addresses the PCB-contaminated soils, sediments, and residuals associated with the 12th St.-OU4. The preferred alternative specified in the ROD includes relocating PCB-contaminated material back into the landfill, capping and containment of the landfill, restoration of affected areas, and long-term monitoring. Prior to construction of the containment system, the PCB-contaminated soils, sediments, and residuals from the landfill sides, woodland, wetlands, adjacent property, and residuals in the former powerhouse discharge channel that are contiguous with the landfill, will be excavated and returned to the landfill.

Based on the comments received during the public comment period, the selected alternative was generally supported. The residents would prefer not to have a non-productive zone (i.e., the closed landfill) in their community and their comments dealt with issues of the long-term effectiveness of the selected alternative. The PRPs generally support the preferred alternative.

These sections follow:

- Background on Community Involvement and Concerns

□ Summary of Comments Received During the Public Comment Period and the MDEQ's Responses

BACKGROUND ON COMMUNITY INVOLVEMENT AND CONCERNS

Prior to the 12th St.-OU4 being included in the Site as a source area, community involvement was non-existent. Since the 12th St.-OU4 became part of the Superfund site, the MDEQ has issued 12 progress reports/fact sheets and hosted 22 public meetings. These meetings and reports covered the time period from the placement of the Site on the NPL, to the Proposed Plan meeting for the 12th St.-OU4. During the public meetings the MDEQ provided background information on the 12th St.-OU4, explained the Superfund process, and provided details of the upcoming investigations and their findings. During July 1993, the MDEQ issued a fact sheet describing the RI work being conducted at the 12th St.-OU4. All phases of the RI/FS were completed by July 1997. The MDEQ issued other fact sheets and progress reports summarizing the results of the test pit investigation and RI. Results of the test pit investigation were presented to the GAC/CAC on August 18, 1993. The majority of the RI results were presented to the GAC/CAC on July 20, 1994. Some additional RI findings were reported at a GAC/CAC meeting held June 12, 1996. The test pitting, RI, and FS reports were released to the public and placed in the six information repositories, listed in Table 2, in February 1994, October 1996, and July 1997, respectively. The Proposed Plan was also released for public review in July 1997. The Administrative Record has been made available to the public at the Superfund Section of the MDEQ in Lansing, Michigan. General site information may also be reviewed at the six information repositories established at the locations shown in Table 2.

TABLE 2

Allegan Public Library 331 Hubbard Street Allegan, Michigan 616-673-4625	Charles Ransom Library 180 South Sherwood Plainwell, Michigan 616-685-8024	Saugatuck-Douglas District Library Center Street Douglas, Michigan 616-857-8241
Kalamazoo Public Library 316 South Rose Kalamazoo, Michigan 616-342-9837	Otsego District Library 219 South Farmer Otsego, Michigan 616-694-9690	Waldo Library Western Michigan University Kalamazoo, Michigan 616-387-5156

A public meeting was held on August 13, 1997, to discuss the Proposed Plan. The meeting was attended by approximately 25 persons, including local residents and representatives of the PRPs. At the meeting, representatives from the MDEQ and the PRPs answered questions about the 12th St.-OU4 and the remedial alternative under consideration. Formal oral comments on the Proposed Plan were documented by a court reporter. A verbatim transcript of questions and answers, and public comments during the public meeting has been placed in the information repositories and Administrative Record. Written comments were accepted at the meeting and by mail and were also placed in the information repositories.

The Proposed Plan was available for public comment from July 30, 1997, through August 30, 1997. Based upon a request for an extension, the MDEQ extended the comment period an additional 15-days. Comments received during this public comment period were reviewed, and the MDEQ responses are included in this Responsiveness Summary. Advertisements announcing the availability of the Proposed Plan and start of the public comment period were published in the *Kalamazoo Gazette,* the *Union Enterprise, Allegan County News & Gazette, Holland Sentinel, and* the *Kalamazoo Gazette-North.*

Summary of Comments Received

Comment 1

One commenter stated that the proposed remedy is not in the public interest because it does not consider possible damage to health.

Response 1

A risk assessment was conducted on the KHL-OU3 and used for the 12th St.-OU4 due to similarities between the two landfills. Both landfills consist of similar materials, have the same chemical of concern, and have similar human and ecological receptors and pathways. They also show similar PCB trends: PCB concentration increases with depth in the landfill, no PCBs were detected in the groundwater, and PCBs have migrated into the Kalamazoo River from both of these areas. Human health risk was assessed for exposure to PCBs through inhalation of dust particles by on-site workers, dermal contact with residuals, and ingestion of contaminated soils/residuals. Although the noncarcinogenic risks were determined not to be of concern, the risk associated with the exposure to the carcinogen PCB for on-site workers, trespassers, and anglers was determined to provide an unacceptable risk.

As stated in the CERCLA, all remedies must meet the threshold criterion of being protective of human health and the environment. It has been determined that the remedy selected for the 12th St.-OU4 meets this criterion. Consolidating residuals that have migrated from the landfill into the surrounding woodland, wetlands, adjacent property, and the former powerhouse discharge channel of the Kalamazoo River in the vicinity of the landfill will reduce the areal extent of PCB-containing materials. Capping the residuals consistent with Part 115, Solid Waste Management, of the NREPA will significantly reduce or eliminate the potential exposure and risks associated with inhalation, dermal contact, and ingestion of residuals. Berm construction with slope stabilization, in combination with the landfill cap, will further reduce or eliminate erosion of PCBs into the area surrounding the landfill, thereby reducing potential exposure to PCBs. Institutional controls will also be implemented to restrict access and future use of the Site in order to protect public health, safety and welfare, and the environment.

Comment 2

One commenter was concerned that ease and cost were the only thoughts involved in the selection of a remedy.

Response 2

In accordance with the CERCLA and the NCP, the remedial alternatives were evaluated against nine criteria. The criteria are grouped into three categories: threshold, primary balancing, and modifying. The first of these, threshold criteria, consists of protection of human health and the environment and compliance of ARARs. A remedy can only be considered for implementation if it meets these criteria. The primary balancing criteria category contains long-term effectiveness and permanence; reduction of toxicity, mobility, or volume through treatment; short-term effectiveness; implementability; and cost. These criteria are used to compare the remedial alternatives against one another. The modifying criteria, consisting of support agency and community acceptance, are used to assess U.S. EPA and community support of the remedy. The preferred alternative can be modified based on the U.S. EPA's and community's comments on the Proposed Plan.

Ease (or implementability) and cost were categorized as primary balancing criteria and were therefore used to compare one alternative to another. These two criteria were considered as part of the nine criteria as the NCP requires but were not given any more weight than other primary balancing criteria. However, prior to comparing the remedy to the primary balancing criteria it was determined that the

remedy met the threshold criteria of being protective of human health and the environment and complied with ARARs.

Comment 3

One commenter stated that soils behind the dams and "hot spots" in the river should be addressed before the landfill is capped.

Response 3

The first step in the strategy for the remediation of this site is to shut-off the external sources of PCB to the Kalamazoo River and Portage Creek. Beginning at the upstream locations, major external sources of PCB include the landfill, the King Highway Landfill, the Willow Boulevard/A-Site, and the Allied Paper property. Once the external sources are controlled, we can begin with the river. During this RA, however, a portion of the area of the Kalamazoo River known as the former powerhouse discharge channel shall be remediated.

Comment 4

Three commenters and the Kalamazoo River Protection Association (KRPA) stated that containment walls or berms are needed at the landfill due to its proximity to the river. The KRPA suggested using 300 feet of impenetrable materials, including a bulkhead or seawall for support and erosion control.

Response 4

The new containment system will increase side slope stability and eliminate/reduce erosion. Items such as the composition of materials, height of the new containment system to be installed, and the side slopes to be stabilized shall be determined during RD. In addition, a buffer zone of adequate distance shall be created to ensure that, for the lifetime of the remedy, no hydraulic connection will exist between the wastes in the landfill and the Kalamazoo River/former powerhouse discharge channel.

Comment 5

Four commenters expressed a concern over the recreational use and aesthetics of the landfill after the remedy is implemented. Several persons suggested that the landfill be used as a scenic stop along the future river trail walkway, a boat ramp, or a park. Two commenters stated that the local habitat should be restored to high

quality after the landfill is capped. Another suggested that any rip-rap next to the Kalamazoo River be dressed to be aesthetically pleasing.

Response 5

After disposal of PCB-contaminated materials back into the landfill and capping, the landfill shall be seeded and maintained to provide an aesthetically acceptable appearance. The type of vegetation shall be selected during the RD process. The RD process shall also determine what kind of erosional control structures would be necessary at the 12th St.-OU4.

Although the post-closure plan for the landfill will necessarily include institutional controls such as access restrictions as required by Part 201, Environmental Remediation, of the NREPA, the remedy is not expected to prohibit the restoration back to high quality habitat.

Comment 6

Many commenters stated their support of the remedy because it prevents contaminants from migrating to the Kalamazoo River and Lake Michigan.

Response 6

The MDEQ acknowledges these comments.

Comment 7

Six commenters, the KRPA, and the Michigan United Conservation Club (MUCC) stated that the landfill should be moved out of the 100-year floodplain of the Kalamazoo River.

Response 7

Off-site disposal of the landfill contents (i.e., PCB-contaminated residuals) was evaluated as a possible remedial alternative in the Alternative Arrays Document and the Focused Feasibility Study (FFS) for the KHL-OU3. For the reasons stated in the KHL-OU3 ROD, this alternative was not selected. The MDEQ determined there, as it has here, that the cap and containment alternative satisfies all of the requirements of the CERCLA and Part 201, Environmental Remediation, of the NREPA. Moreover, it has been determined that the landfill is out of the 100-year flood elevation. The RD process shall address the erosion protection necessary to protect the containment system from the erosional effects of a 500-year flood.

Comment 8

One commenter and the KRPA insisted that all sediments and residuals outside the landfill be removed down to 0.33 ppm Method of Detection Level to be protective of wildlife, especially sensitive receptors such as mink.

Response 8

This RA shall excavate the PCB-contaminated material that eroded from the landfill into the adjacent areas and relocate that material back into the landfill. Post-excavation sampling will be conducted and a final determination whether or not additional response actions are necessary will be made as part of the ROD for the Phase I portion of the Kalamazoo River.

Comment 9

One commenter stated that the flexible membrane liner (FML) should be able to withstand burrowing animals such as woodchucks and muskrats. Another asked if data exists to show how brittle the FML becomes when exposed to long cold periods.

Response 9

Construction of the landfill capping is consistent with the requirements of Part 115, Solid Waste Management, of the NREPA. The cap shall consist of a six-inch topsoil layer underlain by a barrier layer at least two feet in depth, a 30-mil thick FML and a six-inch granular fill layer. The MDEQ Waste Management Division has determined that a barrier layer at least two feet thick will protect against freeze/thaw damage to the FML, even when subject to long cold periods. To control damage from burrowing animals, a monitoring repair and animal control program shall be implemented.

Comment 10

Two commenters were concerned that capping provides a temporary solution to the PCB contamination rather than a permanent one. One person stated that the remedy should eliminate rather than reduce the potential migration of PCBs into the Kalamazoo River.

Response 10

If maintained properly, the landfill cap should provide long-term protection of human health and the environment. Residuals containing PCBs will be confined beneath the cap and therefore will not come into contact with humans or wildlife. With proper construction and maintenance of the cap, the remedy will adequately control the release of PCBs to the environment.

Comment 11

The KRPA and one other commenter insisted that the PRPs be financially accountable for cleaning and restoring the Site.

Response 11

The PRPs for the Site, Millennium Holdings, Inc./Allied Paper, Inc., Georgia-Pacific Corporation, Simpson-Plainwell Paper Company, and James River Corporation signed an AOC (DFO-ERD-91-001) with the state of Michigan in 1991. Under the AOC, the PRPs have agreed to fund and conduct the RI and FS and reimburse the state for oversight. When the ROD for the 12th St.-OU4 is signed, the PRPs will be given the opportunity to implement the chosen remedy. If they decline, the U.S. EPA and MDEQ will conduct the cleanup with money from the Superfund and state appropriations and pursue reimbursement from the PRPs.

Comment 12

Three commenters and the KRPA expressed a concern that the cap may not stop erosion from river meander. They added that, since the residuals are present below the mean water level of the river, everyday erosion may have a significant effect on the landfill. The KRPA added that, if the dam is removed or fails, the river may cut into the landfill.

Response 12

Detailed specifications of the landfill cap and associated erosion control measures will be determined in the RD phase of the Superfund process. New containment system construction, placement of erosion protection, and a buffer zone between the landfill and the Kalamazoo River should adequately protect against the everyday erosive forces of the river. Protection against a 500-year flood event will be incorporated into the final cap design. This includes construction of a new containment system and erosion protection that extends to a minimum elevation of 707 feet MSL, which is approximately two feet above the 100-year flood elevation.

If dam removal is undertaken, it will be done in a manner that is consistent with the remedy. If the river starts to meander, the PRPs would be required to take actions that assure the integrity of the cap and containment system.

Comment 13

Two persons and the KRPA commented that visual criteria should not be used when dredging the river or consolidating waste from outside the landfill boundaries.

Response 13

A visual criterion is being used to direct the excavation of the residual material that has eroded from the landfill. Verification sampling will be performed after removal is complete. A decision on whether additional response actions are necessary will be included as part of the ROD for the Phase I portion of the Kalamazoo River.

Comment 14

The KRPA commented that more sampling is necessary in the area to determine the amount of residuals present.

Response 14

The amount of residuals present was estimated by reviewing historical information, conducting 16 test pits and several soil borings, installing 15 monitor wells and three leachate wells, and conducting field reconnaissance along the periphery of the landfill in the adjacent properties. Samples were collected from within the landfill as well as from locations outside the landfill. Laboratory analyses of soil, sediment, and residuals, and visual classification of deposits have been recorded. The MDEQ has determined that the RI sampling and field reconnaissance was adequate to estimate the extent of PCB contamination. Additional investigation will, however, be conducted during the design of the excavation and disposal activities to better define the extent of material impacted with PCBs.

Comment 15

The KRPA and one commenter proposed the use of a nearby gravel pit as a landfill in which the PCB-contaminated residuals from the 12th St.-OU4 could be placed.

Response 15

The MDEQ evaluated the option of transporting the PCB-contaminated residuals to an off-site location in the removal alternative evaluated in the FFS for the KHL-OU3, which is directly applicable to the 12th St.-OU4. The preferred alternative was the cap and containment alternative.

Comment 16

The KRPA stated that presumptive remedies should not be used at the12th St.-OU4 due to the differences between it and the KHL-OU3. The differences mentioned were that the King Highway Landfill has a berm and the landfill has no berms and is by a wetland and a dam.

Response 16

The presumptive remedy approach was proposed for the landfill due to its similarity to the King Highway Landfill:

- Each landfill is comprised of large amounts of paper-making residuals which contain PCBs. Residuals in each landfill were generated from the same paper manufacturing process.
- Each landfill accepted paper-making residuals produced during the same time period.
- Each landfill is adjacent to the Kalamazoo River and floodplain.

The differences between the landfill and the King Highway Landfill were examined and determined not significant enough to change the selection of the remedy itself. Containment and capping will provide adequate protection of human health and the environment at both the King Highway Landfill and the landfill.

Comment 17

The KRPA commented that there has not been an adequate risk assessment for the 12th St.-OU4.

Response 17

The risk assessment conducted for the KHL-OU3 was determined to be generally applicable to the 12th St.-OU4. In addition, a Site-wide BERA (June 1999 and August 2000 addendum) has been completed.

Comment 18

The KRPA stated that, as the paper waste (excluding PCBs) breaks down, chemical changes will create a need for groundwater monitoring. Another commenter asked whether the remedy adequately protects groundwater in the future.

Response 18

The implementation of a long-term groundwater monitoring plan compliant with Part 201, Environmental Remediation, of the NREPA and the TSCA (40 CFR Section 761.61(c)) will ensure effectiveness of the remedy. The details of the monitoring plan will be determined in the RD stage of the Superfund process.

Comment 19

The KRPA and the MUCC stated that the hydraulic vacuum dredge is a more environmentally sound method for dredging than the backhoe.

Response 19

The MDEQ determined that removal of the residual material in the former powerhouse discharge channel that is contiguous with the landfill will be most effective by enclosing the area with sheet piling, dewatering, then excavating the material and relocating it back into the landfill. Proper siltation controls will be implemented during the procedure.

Comment 20

The KRPA expressed a concern that the remedy selected for the 12th St.-OU4 will set precedence at the other landfills within the Site.

Response 20

Except as noted in this ROD with regard to the relevance of the KHL-OU3 to the remedy selection for this 12th St.-OU4, the individual OUs at the Site have been (or will be) investigated and evaluated separately. This approach is consistent with the AOC between the MDEQ and the PRPs, and also is consistent with the CERCLA, the NCP, and Part 201, Environmental Remediation, of the NREPA.

The various reaches of the river, and within each individual river OU need to be treated on a case by case basis. It is not likely that one remedial alternative, or technology, will be adequate to address the variety of conditions in and along the Kalamazoo River and Portage Creek.

ATTACHMENT 1

Attachment 1
Community Relations Activities for the 12th St.-OU4 of the Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund Site

Community relations activities conducted for the 12th St.-OU4 include:

December 5, 1990 Pre-meeting With Local Officials

A meeting was held with local elected officials prior to the general public meeting on the scoping of the RI. The site history, Superfund process, RI, and the TAG were discussed.

December 12, 1990 Public Information Meeting

The start of the scoping process for the RI was announced. Held in the city of Kalamazoo, this meeting provided information about site history, the Superfund process, the RI, and the TAG. It was also the first meeting since the site was placed on the NPL.

March 19, 1991 Public Information Meeting

The MDEQ and MDCH met with the citizens of the Edison, Homecrest Circle, Milwood, Westnedge Hill, and Vine neighborhoods at their request to provide information and discuss issues of concern. Site history, the Superfund process, the AOC, and risk assessments were discussed.

January 15, 1992 Public Information Meeting

Progress on the development of the RI/FS work plan and site status were presented at the meeting held in the city of Allegan. The KRPA discussed the TAG.

December 2, 1992 Public Information Meeting

Representatives from the MDEQ, EPA, and the KRPA met to discuss the community relations role of the KRPA as the TAG recipient[1]. To assist the KRPA in reviewing and preparing comments on the documents generated and technical issues discussed concerning the site, the KRPA has used funding provided by the EPA under a TAG to retain consultants.

[1] As a recipient of the EPA's TAG, the KRPA has been selected to represent the citizens of the state of Michigan in matters concerning the Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund site. As the TAG representative, it is the responsibility of the KRPA to provide an opportunity to all public groups and concerned citizens to voice their concerns and opinions to the MDEQ through the KRPA.

January 13, 1993 GAC Meeting

Twenty participants from local governments were present at the meeting held in the city council chambers in the city of Plainwell. The January 1993 Site Problem Statement was distributed and discussed and Progress Report #5 concerning the RI was reviewed.

February 17, 1993 Public Information Meeting

A progress report on work plan development for the RI was presented. The MDEQ project managers explained the Superfund process and discussed the OU work plan. A brief overview of the Portage Creek/Kalamazoo River work plan was also presented.

February 23, 1993 GAC Meeting

The MDEQ and GAC members discussed OU work plans at the meeting held at the Parchment City Hall.

March 3, 1993 Public Information Meeting

A progress report on the RI was presented at the meeting which was held in the city of Allegan. MDEQ project managers presented an explanation of the Superfund process and discussed the Portage Creek/Kalamazoo River work plan development. A brief overview of the OU work plan was also presented.

March 10, 1993 GAC Meeting

RI work plans for Portage Creek/Kalamazoo River and the OUs were discussed at the meeting which was held in the Kalamazoo Township Hall.

March 18, 1993 CAC Meeting

The MDEQ project managers presented a description of the Superfund process, an overview of work plan development, and other site information. The KRPA was introduced to the public. There was a presentation on the Area of Concern program, a program administered by the SWQD that addresses a variety of issues related to the river basin. The meeting was held at the Plainwell Comfort Inn in the city of Plainwell.

April 14, 1993 CAC Meeting

The proposed test pit investigation of the 12th Street Landfill in Plainwell was discussed at the Plainwell Comfort Inn in the city of Plainwell.

June 23, 1993 GAC Meeting

Discussions were held on: (1) preliminary health assessment, (2) human health risk assessment, (3) ecological risk assessment, and (4) the fish consumption advisory in effect for sections of the river.

August 18, 1993 GAC Meeting

The 12th Street Landfill OU test pit investigation was addressed and the status of the RI and Biota Sampling Plan was updated. The meeting was held in the Cooper Township Hall in Cooper Township.

August 18, 1993 CAC Meeting

The 12th Street Landfill OU test pit investigation was addressed and the status of the RI and Biota Sampling Plan was updated. The meeting was held at the Plainwell Comfort Inn in Plainwell.

November 3, 1993 CAC Meeting

The MDEQ project manager discussed the Superfund process. The BBL project manager gave a progress report and update on the site RI. The schedule for submittal of draft documents to the MDEQ was distributed and discussed. The meeting was held at the Plainwell Comfort Inn in Plainwell.

November 3, 1993 GAC Meeting

The MDEQ project manager discussed the Superfund process. The BBL project manager gave a progress report and update on the site RI. The schedule for submittal of draft documents to the MDEQ was distributed and discussed. The meeting was held at the Plainwell Comfort Inn in Plainwell.

November 18, 1993 Presentation to the Kalamazoo Environmental Council

The MDEQ project manager gave a presentation on the Superfund process, an update on site progress, and an overview of the processes taking place. Future expectations related to the RI were also discussed.

December 8, 1993 Public Information Meeting-Progress Update

The MDEQ provided an overview of the Superfund program and an update on the progress being made in the 12th St.-OU4 and site RI. Additional comments were provided by the KRPA. Approximately 40 people attended the meeting, which was held at the Comfort Inn in Plainwell.

May 18, 1994 GAC Meeting, CAC Meeting

The BBL project manager presented the results of the RI air monitoring from the four OUs. The MDEQ project manager gave a site update and led the question and answer period. The meetings were held at the Comfort Inn in Plainwell.

July 20, 1994 GAC Meeting, CAC Meeting

The project manager from Geraghty & Miller, Inc., discussed the 12th Street Landfill RI results. The MDEQ project managers opened the meeting and discussed the current site status. The upcoming meeting for the King Highway Landfill Proposed Plan was announced.

March 8, 1995 Combined GAC and CAC Meeting

The KHL-OU3 was discussed, as well as additional RI work and the ongoing PRP search.

June 10, 1997 GAC Meeting

Presumptive remedies were discussed. The BBL project manager presented an update of the site status and focused on the King Highway Landfill.

June 10, 1997 CAC Meeting

Presumptive remedies for the OUs were discussed. The BBL project manager presented an update of the site status and focused on the King Highway Landfill. A schedule for completion of Proposed Plans and RODs for all OUs was presented and later mailed to all GAC/CAC members.

August 13, 1997 Public Meeting

The Proposed Plan for 12th St.-OU4 was presented to the public at the Plainwell Comfort Inn in Plainwell, Michigan.

ATTACHMENT 2

ATTACHMENT 2

REMEDIAL INVESTIGATION REPORT
12th STREET LANDFILL OPERABLE UNIT
PLAINWELL, MICHIGAN
ALLIED PAPER, INC./PORTAGE CREEK/
KALAMAZOO RIVER SUPERFUND SITE

TABLES

December 1996

Submitted to

Environmental Response Division
Michigan Department of Natural Resources
P.O. Box 30028
Lansing, Michigan 48909

Submitted by

Simpson Plainwell Paper Company,
a member of the
Kalamazoo River Study Group

Prepared by

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Table 1. Detected Compound Concentrations and Cleanup Criteria of Organic and Inorganic Compounds in Surface Soil and, Surface Residual Samples, 12th Street Landfill Operable Unit, Plainwell, Michigan.

Compound	Frequency Detected	Range of Concentrations (mg/kg)	Maximum Upgradient Concentrations {A} (mg/kg)	Generic Industrial Direct Contact Value (mg/kg)
VOCs				
Acetone	11/16	0.026 - 0.29	ND	74,000
2-Butanone	2/16	0.012 - 0.065	ND	1,000,000
Carbon disulfide	2/16	0.007 - 0.017	ND	82,000
Toluene	1/16	0.003	ND	160,000
SVOCs				
Anthracene	3/16	0.020 - 0.065	ND	1,000,000
Benzo(a)anthracene{B}	4/16	0.059 - 0.21	ND	210
Benzo(a)pyrene{B}	5/16	0.075 - 0.20	ND	21
Benzo(b)fluoranthene{B}	5/16	0.062 - 0.20	ND	210
Benzo(g,h,i)perylene	1/16	0.032	ND	16,000
Benzo(k)fluoranthene{B}	5/16	0.075 - 0.22	ND	2,100
Carbazole	1/16	0.019	ND	NA
Chrysene{B}	6/16	0.020 - 0.25	ND	21,000
Di-n-butylphthalate	3/16	0.026 - 0.040	ND	540,000
Fluoranthene	7/16	0.027 - 0.39	ND	540,000
Indeno(1,2,3-cd)pyrene{B}	2/16	0.027 - 0.066	ND	210
2-Methylnaphthalene	1/16	0.12	ND	ID
4-Methylphenol	1/16	0.022	ND	23,000
Phenanthrene	4/16	0.044 - 0.58	ND	16,000
Pyrene	7/16	0.027 - 0.34	ND	340,000

Footnotes on Page 4.

Table 1. Detected Compound Concentrations and Cleanup Criteria of Organic and Inorganic Compounds in Surface Soil and, Surface Residual Samples, 12th Street Landfill Operable Unit, Plainwell, Michigan.

Compound	Frequency Detected	Range of Concentrations (mg/kg)	Maximum Upgradient Concentrations (A) (mg/kg)	Generic Industrial Direct Contact Value (mg/kg)
Pesticides				
4,4'-DDD	1/16	0.0056	ND	630
4,4'-DDE	5/16	0.004 - 0.025	ND	440
4,4'-DDT	3/13	0.0032 - 0.023	ND	440
Aldrin	3/16	0.012 - 0.51	ND	8.8
alpha-Chlordane	4/13	0.0032 - 0.027	ND	120
Endosulfan I	1/16	0.0037	ND	1,000
Endosulfan II	1/15	0.036	ND	1,000
Endrin	3/16	0.003 - 0.006	ND	770
gamma-Chlordane	1/15	0.0031	ND	120
Heptachlor	1/15	0.0018	ND	33
PCBs	17/21	0.036 - 158	ND	21 (7)

Footnotes on Page 4.

Table 1. Detected Compound Concentrations and Cleanup Criteria of Organic and Inorganic Compounds in Surface Soil and, Surface Residual Samples, 12th Street Landfill Operable Unit, Plainwell, Michigan.

Compound	Frequency Detected	Range of Concentrations (mg/kg)	Maximum Upgradient Concentrations {A} (mg/kg)	Default Background Concentrations {C} (mg/kg)	Generic Industrial Direct Contact Concentrations (mg/kg)
Inorganic Constituents					
Aluminum	16/16	2800 - 20500	1,940 (8)	6,900 (5)	ID
Antimony	2/16	12.5 - 17.4	ND (2)	NA	1,600
Arsenic	16/16	0.8 - 25.4	4.3 (7)	5.8 (12)	83
Barium	16/16	35.2 - 613	14.5 (14)	75 (12)	320,000
Beryllium	6/16	0.18 - 0.86	0.14 (3)	NA	35
Cadmium	1/16	1.5	ND (1)	1.2 (1)	2,300
Calcium	16/16	2500 - 149000	133,000	NA	NA
Chromium	16/16	7.4 - 156	7.1 (7)	18 (7)	22,000
Cobalt	14/16	2.3 - 10.5	3 (1)	6.8 (2)	23,000
Copper	16/16	3.0 - 68.5	6.8 (6)	32 (3)	170,000
Cyanide	1/16	0.4	ND	0.39 (1)	99,000
Iron	16/16	4110 - 30100	12,900	12,000 (11)	ID
Lead	16/16	4.4 - 116	4.9 (12)	21 (12)	400
Magnesium	16/16	733 - 86900	38,800	NA	1,000,000
Manganese	16/16	111 - 2980	408 (3)	440 (9)	22,000
Mercury	11/16	0.08 - 5	ND (11)	0.13 (7)	1,400
Nickel	15/16	3.2 - 28.4	6.9 (1)	20 (1)	340,000
Potassium	14/16	203 - 2050	234 (2)	NA	NA
Selenium	12/16	0.31 - 4.8	0.74 (3)	0.41 (10)	23,000
Sodium	1/16	176	192	NA	1,000,000 {P}
Vanadium	16/16	6.6 - 49.4	8.5 (6)	NA	39,000
Zinc	16/16	11.7 - 346	14.4 (12)	47 (12)	1,000,000

Footnotes on Page 4.

Table 1. Detected Compound Concentrations and Cleanup Criteria of Organic and Inorganic Compounds in Surface Soil and, Surface Residual Samples, 12th Street Landfill Operable Unit, Plainwell, Michigan.

VOCs	Volatile organic compounds.
SVOCs	Semivolatile organic compounds.
PCBs	Polychlorinated biphenyls.
NA	Not available.
ID	Inadequate data to develop criterion.
ND	Not detected above quantitation limit.
mg/kg	Milligrams per kilogram.
(1)	Number of samples for which criterion was exceeded.
{A}	Consists of results from MW-8B.
{B}	Criteria for carciogenic polynuclear aromatic hydrocarbons (PAHs) were developed using "relative potential potenices" (PPRs) to benzo(a)pyrene.
{C}	Default background concentrations from MERA Operational Memorandum #15, September 30, 1993.
{P}	Direct contact criterion is at saturation in soil. Criterion is actually greater than 100% in soil, hence it is reduced to 100 precent.
{S}	Type B criteria used as the default because no risk assessment tools are currently available to evaluate lead toxicity in adults.
{Q}	Direct contact criterion is at saturation in soil. Criterion was actually calculated as greater than 100% in soil, hence it was reduced to 100%.

Generic industrial direct contact criteria obtained from MDEQ Environmental Response Division Operational Memorandum #14, Revision 2: Remedial Action Plans using Generic Industrial or Generic Commercial Cleanup Criteria and Other Requirements (MDEQ 1995).

simpson/ci0091/ri/tables/surfacs.xlsj

Table 2. Detected Compound Concentrations and Cleanup Criteria of Organic and Inorganic Compounds in Subsurface Soil, 12th Street Landfill Operable Unit, Plainwell, Michigan.

Compound	Frequency Detected	Range of Concentrations (mg/kg)	Maximum Upgradient Concentrations {A} (mg/kg)
VOCs			
Acetone	11/16	0.003 - 0.90	ND
2-Butanone	6/16	0.014 - 0.29	ND
Benzene	2/16	0.009 - 0.046	ND
Carbon disulfide	4/16	0.005 - 0.035	ND
Ethylbenzene	3/16	0.008 - 0.04	ND
Toluene	2/16	0.006 - 0.014	ND
Xylene(Total)	5/16	0.010 - 0.26	ND
SVOCs			
Naphthalene	1/16	0.13	ND
2-Methylnaphthalene	4/16	0.031 - 2.1	ND
Diethylphthalate	1/16	0.070	ND
Fluoranthene	2/16	0.038 - 0.12	ND
Pyrene	1/16	0.27	ND
Pesticides			
4,4'-DDD	2/16	0.031 - 0.13	ND
4,4'-DDE	3/16	0.0047 - 0.68	ND
4,4'-DDT	2/16	0.16 - 0.46	ND
Aldrin	4/16	0.0013 - 0.11	ND
alpha-Chlordane	1/12	0.13	ND
beta-BHC	1/16	0.026	ND
Endrin	1/16	0.006	ND
gamma-BHC	1/16	0.0089	ND
PCBs	19/32	0.027 - 51.6	ND

Footnotes on Page 3.

Table 2. Detected Compound Concentrations and Cleanup Criteria of Organic and Inorganic Compounds in Subsurface Soil, 12th Street Landfill Operable Unit, Plainwell, Michigan.

Compound	Frequency Detected	Range of Concentrations (mg/kg)	Maximum Upgradient Concentrations (A) (mg/kg)	Default Background Concentrations (mg/kg)
Inorganic Constituents				
Aluminum	16/16	1610 - 14700	1940 (6)	6900 (3)
Antimony	2/16	8.4 - 23.5	ND (2)	NA
Arsenic	15/16	1.1 - 23.8	4.3 (2)	5.8 (7)
Barium	16/16	10.1 - 364	14.5 (8)	75 (7)
Beryllium	12/16	0.12 - 0.75	0.14 (1)	NA
Calcium	16/16	497 - 181000	133000	NA
Chromium	16/16	3 - 115	7.1 (4)	18 (4)
Cobalt	14/16	1.3 - 14.9	3 (2)	NA
Copper	16/16	2.7 - 98.4	6.8 (4)	32 (3)
Cyanide	5/16	0.33 - 2.1	0.05 (5)	0.39 (4)
Iron	16/16	3450 - 28100	12900	12000 (6)
Lead	16/16	1.2 - 457	4.9 (5)	21 (3)
Magnesium	16/16	540 - 49100	38800	NA
Manganese	16/16	16.5 - 1040	408	440 (4)
Mercury	5/17	0.06 - 2.2	ND (5)	0.13 (4)
Nickel	16/16	3.5 - 22	6.9 (1)	20 (1)
Potassium	9/16	93.1 - 1260	234 (2)	NA
Selenium	9/16	0.47 - 7.8	0.74 (2)	0.41 (9)
Silver	1/16	2.30000	ND (1)	1.0 (1)
Sodium	9/16	117 - 713	192 (3)	NA
Vanadium	16/16	4.7 - 47.9	8.5 (2)	NA
Zinc	16/16	7.7 - 319	14.4 (5)	47 (5)

Footnotes on Page 3.

Table 2. Detected Compound Concentrations and Cleanup Criteria of Organic and Inorganic Compounds in Subsurface Soil, 12th Street Landfill Operable Unit, Plainwell, Michigan.

GSI	Groundwater- surface-water interface.
mg/kg	Milligrams per kilogram.
NA	Not available.
ND	Not detected above quantitation limit.
(1)	Number of samples for which criterion was exceeded.
{A}	Consists of results from MW-8B.

simpson/ci0091/ri/tables/soil.xlsj

Table 3. Detected Compound Concentrations and Cleanup Criteria of Organic and Inorganic Compounds in Groundwater, 12th Street Landfill Operable Unit, Plainwell, Michigan.

Compound	Frequency Detected (A)	Range of Conc. (mg/L)	Maximum Upgradient Concentrations (B)	Generic Industrial Cleanup Criteria GSI Value (mg/L)
VOCs				
Acetone	1/15	0.014	ND	25
Benzene	1/15	0.001	ND	0.053
Methylene chloride	1/15	0.001	ND	0.059
SVOCs				
bis(2-Ethylhexyl)phthalate	2/15	0.028 - 0.29	ND	0.059 (1)
Inorganic Constituents (Total)				
Aluminum	3/15	0.0721 - 0.0816	ND (3)	(D)
Antimony	1/15	0.0496	ND (1)	0.05
Arsenic	2/15	0.0047 - 0.0049	ND (2)	0.011
Barium	15/15	0.0566 - 0.484	0.0713 (4)	0.63
Beryllium	1/15	0.00089	ND	ID
Calcium	15/15	73.2 - 133	77.7	NA
Copper	2/15	0.0051 - 0.0057	ND	0.018 (E)
Iron	6/15	0.37 - 4.09	0.465 (2)	(D)
Magnesium	15/15	21.6 - 28.6	22.4	ID
Manganese	14/15	0.0201 - 1.25	0.0374 (8)	ID
Nickel	1/15	0.0081	ND (1)	0.057 (C,E)
Potassium	15/15	0.0895 - 2.18	1.96	NA
Sodium	15/15	13.1 - 24.2	20.8	(D)
Zinc	5/15	0.0063 - 0.0562	ND	0.081 (C,E)

Footnotes on Page 2.

Table 3. Detected Compound Concentrations and Cleanup Criteria of Organic and Inorganic Compounds in Groundwater, 12th Street Landfill Operable Unit, Plainwell, Michigan.

(1)	Number of samples for which criterion was exceeded.
NA	Not available.
ND	Not detected above quantitation limit.
ID	Inadequate data to develop criterion.
GSI	Groundwater surface-water interface.
VOCs	Volatile organic compounds.
SVOCs	Semivolatile organic compounds.
mg/L	Milligrams per liter.
{A}	Includes results from MW-1, MW-2A, MW-2B, MW-3A, MW-3B, MW-4A, MW-4B, MW-5A, MW-5B, MW-6A, MW-6B, MW-7A, MW-7B.
{B}	Includes results from MW-8A and MW-8B.
{C}	Background may be submitted as cleanup criteria.
{D}	GSI value may be proposed by the potentially responsible parties.
{E}	GSI value is dependent on water hardness. Value presented was calculated by Michigan Department of Environmental Quality (MDEQ) using a hardness of 178 mg/L calcium carbonate.

simpson/ci0091/ri/tables/grdwtr.xlsJ

Table 4. PCB Concentrations in Residual Samples Collected from the Kalamazoo River, June 1994, 12th Street Landfill Operable Unit, Plainwell, Michigan.

Sample Location:	SD-1	SD-2
Sample Depth:	0-2 ft	0-2 ft
Sample ID:	T90107	T90108
Sample Date:	06/07/94	06/07/94
Matrix:	Sediment	Sediment
Units:	mg/kg	mg/kg
Parameters		
Aroclor-1016	7.1	<3.5
Aroclor-1221	<2.6	<3.5
Aroclor-1232	<2.6	<3.5
Aroclor-1242	<2.6	<3.5
Aroclor-1248	10	29
Aroclor-1254	<2.6	<3.5
Aroclor-1260	<2.6	<3.5
Total PCBs	17.1	29

mg/kg Milligrams per kilogram.
PCBs Polychlorinated biphenyls.
ft Feet.
All samples were analyzed by U.S. Environmental Protection Agency (USEPA) SW-846 method 8081.

simpson/ci0091/ri/tables/pcb.xls

Table 5. Physical and Chemical Properties of Constituents of Concern, 12th Street Landfill Operable Unit, Plainwell, Michigan.

Constituent	Molecular Weight (g/mol)	Water Solubility (mg/L 25°C)	Specific Gravity	Vapor Pressure (mm Hg 25°C)	Henry's Law constant (atm-m^3/mol) (25°C)	Diffusivity (cm^2/sec)	Koc (mL/g)	Log Kow
PCBs	192 - 370	0.012 - 1.45	.15-1.57	4.1E-5 - 6.7E-3	3.24E-4 - 7.10E-3	0.04909 - 0.06717	275 - 2,630,000	2.8 - 6.91

References: Foreman and Bidleman, 1985: Howard et al., 1991; Lyman et al., 1990; Montgomery and Welkom, 1990; USEPA, 1991b; Veith and Koian, 1982; and Verschueren, 1983.

atm-m^3/mol	Atmospheres-cubic meters per mole.
°C	Degrees Celsius.
cm^2/sec	Square centimeters per second.
g/mol	Grams per mole.
Koc	Organic carbon partition coefficient.
Kow	Octanol-water partition coefficient.
L/kg	Liters per kilograms.
mg/L	Milligrams per liter.
mL/g	Milliliters per gram.
mm Hg	Millimeters of mercury.

simpson/ci0091/ri/chemp.xlsj

ATTACHMENT 3

ATTACHMENT 3

TECHNICAL MEMORANDUM 8
REMEDIAL INVESTIGATION
12th STREET LANDFILL OPERABLE UNIT
PLAINWELL, MICHIGAN
ALLIED PAPER, INC./PORTAGE CREEK/
KALAMAZOO RIVER SUPERFUND SITE

TABLES

May 1994

Submitted to

Scott Cornelius
Environmental Response Division
Michigan Department of Natural Resources
P.O. Box 30028
Lansing, Michigan 48909

Submitted by

Simpson Plainwell Paper Company,
a member of the
Kalamazoo River Study Group

Prepared by

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Table 2-1. USEPA Contract Laboratory Program Target Compound List/Target Analyte List, 12th Street Landfill Operable Unit, Plainwell, Michigan.

VOCs

1,1,1-Trichloroethane
1,1,2,2-Tetrachloroethane
1,1,2-Trichloroethane
1,1-Dichloroethane
1,1-Dichloroethene
1,2-Dichloroethane
1,2-Dichloroethene (total)
1,2-Dichloropropane
2-Butanone
2-Hexanone
4-Methyl-2-pentanone
Acetone
Benzene
Bromodichloromethane
Bromoform
Bromomethane
Carbon disulfide
Carbon tetrachloride
Chlorobenzene
Chloroethane
Chloroform
Chloromethane
cis-1,3-Dichloropropene
Dibromochloromethane
Ethylbenzene
Methylene chloride
Styrene
Tetrachloroethene
Toluene
trans-1,3-Dichloropropene
Trichloroethene
Vinyl chloride
Xylenes (total)

SVOCs

Acenaphthene
Acenaphthylene
Anthracene
Benzo(a)anthracene
Benzo(b)fluoranthene
Benzo(k)fluoranthene
Benzo(g,h,i)perylene
Benzo(a)pyrene
4-bromophenyl phenyl ether
Butyl benzyl phthalate
Carbazole
4-Chloroaniline
bis(2-chloroethoxy)methane
bis(2-chloroethyl)ether
4-Chloro-3-methyl phenol
2-Chloronaphthalene
2-Chlorophenol
4-Chlorophenyl phenyl ether
2,2'-Oxybis(1-chloroporane)
Chrysene
Dibenz(a,h)anthracene
Dibenzofuran
Di-n-butylphthalate
1,2-Dichlorobenzene
1,3-Dichlorobenzene
1,4-Dichlorobenzidine
3,3-Dichlorobenzidine
2,4-Dichlorophenol
Diethyl phthalate
2,4-Dimethylphenol
4,6-Dinitro-2-methyl phenol
Dimethyl phthalate
2,4-Dinitrophenol
2,4-Dinitrotoluene
2,6-Dinitrotoluene
Di-n-octyl phthalate
bis(2-Ethylhexyl)phthalate
Fluoranthene
Fluorene
Hexachlorobenzene
Hexachlorobutadiene
Hexachlorocyclopentadiene
Hexachloroethane
Ideno(1,2,3-cd)pyrene
Isophorone
2-Methylnaphthalene
2-Methylphenol
4-Methylphenol
Napthalene
2-Nitroaniline
3-Nitroaniline
4-Nitroaniline
Nitrobenzene
2-Nitrophenol
4-Nitrophenol
n-Nitrosodiphenylamine
n-Nitroso-di-n-propylamine
Pentachlorophenol
Phenanthrene
Phenol
Pyrene
1,2,4-Trichlorobenzene
2,4,5-Trichlorophenol
2,4,6-Trichlorophenol

VOCs Volatile Organic Compounds
SVOCs Semivolatile Organic Compounds
PCBs Polychlorinated Biphenyls

References: TCL: USEPA, 1991a.
TAL: USEPA, 1991b.

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Table 2-1. USEPA Contract Laboratory Program Target Compound List/Target Analyte List, 12th Street Landfill Operable Unit, Plainwell, Michigan.

Pesticides/PCB Compounds

Aldrin		Methoxychlor
alpha-BHC	Dieldrin	Toxaphene
beta-BHC	Endosulfan I	Aroclor - 1016
gamma-BHC (lindane)	Endosulfan II	Aroclor - 1221
delta-BHC	Endosulfan sulfate	Aroclor - 1232
alpha-Chlordane	Endrin	Aroclor - 1241
gamma-Chlordane	Endrin aldehyde	Aroclor - 1248
4,4 DDD	Endrin ketone	Aroclor - 1254
4,4 DDE	Heptachlor	Aroclor - 1260
4,4 DDT	Heptachlor epoxide	

Metals/Other Compounds

Aluminum	Iron	Thallium
Antimony	Lead	Vanadium
Arsenic	Magnesium	Zinc
Barium	Manganese	Cyanide
Beryllium	Mercury	
Cadmium	Nickel	
Calcium	Potassium	
Chromium	Selenium	
Cobalt	Silver	
Copper	Sodium	

VOCs Volatile Organic Compounds
SVOCs Semivolatile Organic Compounds
PCBs Polychlorinated Biphenyls

References: TCL: USEPA, 1991a.
TAL: USEPA, 1991b.

[illegible]

Table 2-2. Remedial Investigation Soil/Residuals Samples, 12th Street Landfill Operable Unit, Plainwell, Michigan.

Location	Depth (feet)	Medium	Sample Number	Analysis	Comments
Equip. Blank		Water	T90022	CLP TCL/TAL	Rinse Blank
DB-13	NA	Residuals	T90023	PCB	
DB-13	NA	Berm Sand	T90024	CLP TCL/TAL	
DB-14	0 - 1	Soil	T90025	CLP TCL/TAL	
MW-4	10 - 12	Soil	T90026	PCB	
MW-4B	2 - 4	Soil	T90027	CLP TCL/TAL	
MW-4B	2 - 4	Residuals	T90028	CLP TCL/TAL	
MW-2B	3.1 - 4.6	Residuals	T90029	CLP TCL/TAL	
MW-2B	4.6 - 6.0	Soil	T90030	CLP TCL/TAL	
MW-3	2 - 4	Soil	T90032	CLP TCL/TAL	
MW-3	2 - 4	Residuals	T90033	CLP TCL/TAL	
MW-3	12 - 14	Soil	T90034	PCB	
Bldg. Water Source		Water	T90035	CLP TCL/TAL	Water Supply Source
MW-5	0 - 2	Soil	T90036	CLP TCL/TAL	
MW-5	10 - 12	Soil	T90037	PCB	
MW-5	20 - 22	Soil	T90038	PCB	
MW-5	0 - 2	Residuals	T90039	CLP TCL/TAL	
Rinse Blank		Water	T90040	CLP TCL/TAL	Rinse
MW-2B	14 - 16	Soil	T90041	PCB	
MW-2B	24 - 26	Soil	T90042	PCB	
MW-6B	6 - 8	Soil	T90043	CLP TCL/TAL	
MW-6B	16 - 18	Soil	T90044	PCB	

CLP TCL/TAL Contract Laboratory Program Target Compound List/Target Analyte List.
PCBs Polychlorinated biphenyls.
MS/MSD Matrix spike/matrix spike duplicate.
NA Data not available.

Table 2-2. Remedial Investigation Soil/Residuals Samples, 12th Street Landfill Operable Unit, Plainwell, Michigan.

Location	Depth (feet)	Medium	Sample Number	Analysis	Comments
DB-1	1 - 2	Soil	T90000	CLP TCL/TAL	
DB-1	1 - 2	Residuals	T90001	PCB	
DB-2	0 - 1	Soil	T90002	CLP TCL/TAL	
DB-3	1 - 2	Residuals	T90003	PCB	
DB-3	4 - 5	Peat	T90004	CLP TCL/TAL	
DB-4	1 - 2	Peat	T90005	CLP TCL/TAL	
DB-6	0 - 1	Soil	T90006	CLP TCL/TAL	
DB-5	NA	Residuals	T90007	PCB	
DB-5	NA	Soil	T90008	CLP TCL/TAL	
DB-7	NA	Residuals	T90009	PCB	Duplicate of T90011
DB-8	0 - 1	Soil	T90010	CLP TCL/TAL	
DB-7	NA	Residuals	T90011	PCB	
DB-8	0 - 1	Soil	T90012	CLP TCL/TAL	Duplicate of T90010
DB-7	NA	Soil	T90013	CLP TCL/TAL	
DB-10	0 - 1	Soil	T90014	CLP TCL/TAL	
DB-9	0 - 1	Residuals	T90015	PCB	MS/MSD
DB-9	1 - 2.5	Soil	T90016	CLP TCL/TAL	
Equip. Blank		Water	T90017	CLP TCL/TAL	Rinse Blank
DB-12	0 - 1	Soil	T90018	CLP TCL/TAL	
DB-12	0 - 1	Soil	T90019	CLP TCL/TAL	Duplicate of T90018
DB-11	NA	Residuals	T90020	PCB	
DB-11	NA	Soil	T90021	CLP TCL/TAL	MS/MSD

CLP TCL/TAL Contract Laboratory Program Target Compound List/Target Analyte List.
PCBs Polychlorinated biphenyls.
MS/MSD Matrix spike/matrix spike duplicate.
NA Data not available.

Table 2-2. Remedial Investigation Soil/Residuals Samples, 12th Street Landfill Operable Unit, Plainwell, Michigan.

Location	Depth (feet)	Medium	Sample Number	Analysis	Comments
MW-6B	22 - 24	Soil	T90045	PCB	
MW-7B	8 - 10	Soil	T90046	CLP TCL/TAL	
MW-7B	13 - 15	Soil	T90047	PCB	
MW-7B	24 - 26	Soil	T90048	PCB	
MW-7B	13 - 15	Soil	T90049	PCB	Duplicate of T90047
SB-3	2 - 4	Residuals	T90051	PCB	
SB-3	12 - 14	Residuals	T90054	PCB	
SB-3	14 - 16	Residuals	T90055	PCB	
SB-3	16 - 18	Residuals	T90056	CLP TCL/TAL	
SB-2	8 - 10	Residuals	T90061	PCB	
SB-2	18 - 20	Residuals	T90066	PCB	
SB-2	20 - 22	Residuals	T90067	PCB	
SB-2	22 - 24	Residuals	T90068	CLP TCL/TAL	
SB-2	22 - 24	Soil/Residuals/Fly Ash	T90069	CLP TCL/TAL	
Rinse Blank		Water	T90070	CLP TCL/TAL	Rinse Blank
SB-4	26 - 28	Residuals	T90072	CLP TCL/TAL	MS/MSD
SB-4	26 - 28	Soil	T90073	CLP TCL/TAL	
SB-4	26 - 28	Soil	T90074	PCB	MS/MSD
SB-4	24 - 26	Residuals	T90075	PCB	
SB-4	22 - 24	Residuals	T90076	PCB	
SB-4	4 - 6	Residuals	T90077	PCB	
SB-7	24 - 26	Residuals	T90078	CLP TCL/TAL	Duplicate of T90078

CLP TCL/TAL Contract Laboratory Program Target Compound List/Target Analyte List.
PCBs Polychlorinated biphenyls.
MS/MSD Matrix spike/matrix spike duplicate.
NA Data not available.

Table 2-2. Remedial Investigation Soil/Residuals Samples, 12th Street Landfill Operable Unit, Plainwell, Michigan.

Location	Depth (feet)	Medium	Sample Number	Analysis	Comments
SB-7	24 - 26	Residuals	T90079	CLP TCL/TAL	
SB-7	24 - 26	Soil	T90080	CLP TCL/TAL	
SB-7	22 - 24	Residuals	T90081	PCB	
SB-7	20 - 22	Residuals	T90082	PCB	
SB-7	18 - 20	Residuals	T90083	PCB	
SB-7	8 - 10	Residuals	T90084	PCB	
SB-6	20 - 22	Residuals	T90085	CLP TCL/TAL	
SB-6	20 - 22	Residuals	T90086	CLP TCL/TAL	MS/MSD
SB-6	24 - 26	Soil	T90087	CLP TCL/TAL	
SB-6	24 - 26	Soil	T90088	CLP TCL/TAL	MS/MSD
SB-5	20 - 22	Soil (fill)	T90089	CLP TCL/TAL	
SB-5	20 - 22	Soil	T90090	CLP TCL/TAL	
SB-6	4 - 6	Residuals	T90091	PCB	
SB-6	14 - 16	Residuals	T90092	PCB	
SB-6	18 - 20	Soil	T90093	PCB	
SB-6	20 - 22	Residuals	T90094	PCB	
SB-5	8 - 10	Residuals	T90095	PCB	
SB-5	12 - 14	Soil	T90096	PCB	
SB-1	26 - 28	Residuals	T90097	CLP TCL/TAL	
SB-1	26 - 28	Soil	T90098	CLP TCL/TAL	
SB-1	26 - 28	Soil	T90099	CLP TCL/TAL	Dup of T90098
SB-1	22- 24	Residuals	T90100	PCB	

CLP TCL/TAL Contract Laboratory Program Target Compound List/Target Analyte List.
PCBs Polychlorinated biphenyls.
MS/MSD Matrix spike/matrix spike duplicate.
NA Data not available.

Table 2-2. Remedial Investigation Soil/Residuals Samples, 12th Street Landfill Operable Unit, Plainwell, Michigan.

Location	Depth (feet)	Medium	Sample Number	Analysis	Comments
SB-1	22- 24	Residuals	T90101	PCB	
Rinse Bank		Water	T90102	CLP TCL/TAL	Rinse Blank
MW-8B	30 - 32	Soil	T90103	CLP TCL/TAL	
Rinse Blank		Water	T90104	CLP TCL/TAL	Rinse Blank
MW-1	6 - 8	Residuals	T90105	CLP TCL/TAL	
MW-1	6 - 8	Soil	T90106	CLP TCL/TAL	

CLP TCL/TAL Contract Laboratory Program Target Compound List/Target Analyte List.
PCBs Polychlorinated biphenyls.
MS/MSD Matrix spike/matrix spike duplicate.
NA Data not available.

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Table 2-3. Remedial Investigation Groundwater/Leachate Samples, 12th Street Landfill Operable Unit, Plainwell, Michigan.

Location	Medium	Sample Number	Analysis	Comments
MW-4A	Groundwater	T94000	CLP TCL/TAL	
MW-4B	Groundwater	T94001	CLP TCL/TAL	
MW-2B	Groundwater	T94002	CLP TCL/TAL	
MW-2A	Groundwater	T94003	CLP TCL/TAL	
MW-2A	Groundwater	T94004	CLP TCL/TAL	Duplicate of T94003
MW-6A	Groundwater	T94005	CLP TCL/TAL	
MW-6B	Groundwater	T94006	CLP TCL/TAL	
MW-5A	Groundwater	T94007	CLP TCL/TAL	
MW-5B	Groundwater	T94008	CLP TCL/TAL	
MW-1	Groundwater	T94009	CLP TCL/TAL	
MW-7B	Groundwater	T90010	CLP TCL/TAL	
MW-7A	Groundwater	T94011	CLP TCL/TAL	
MW-8B	Groundwater	T94012	CLP TCL/TAL	
MW-8A	Groundwater	T94013	CLP TCL/TAL	
MW-3A	Groundwater	T94014	CLP TCL/TAL	Duplicate of T94015
MW-3A	Groundwater	T94015	CLP TCL/TAL	
MW-3B	Groundwater	T94016	CLP TCL/TAL	
LH-3	Leachate	T94017	CLP TCL/TAL	
LH-1	Leachate	T94018	CLP TCL/TAL	
LH-2	Leachate	T94019	CLP TCL/TAL	
Rinse Blank	Water	T94020	CLP TCL/TAL	

CLP TCL/TAL Contract Laboratory Program Target Compound List/Target Analyte List

Table 3-1. Groundwater and Leachate Elevations, 12th Street Landfill Operable Unit, Plainwell, Michigan.

Well/River Gauge No.:	RG-4	MW-6A			RG-5	MW-7A		
Date Installed:		03-Aug-93				04-Aug-93		
Date Developed:		23-Aug-93				23-Aug-93		
Volume Developed (gal):		35				60		
Date Sampled:		09-Sep-93				13-Sep-93		
Date	Elevation	Depth to Water	Elevation	Flow Reversal	Elevation	Depth to Water	Elevation	Flow Reversal
31-Aug-93	NR	9.52	700.81	NR	NR	9.38	700.54	NR
03-Sep-93	707.21	9.27	701.06	No	699.86	8.07	701.85	No
12-Sep-93	707.04	9.56	700.77	No	699.63	8.35	701.57	No
28-Sep-93	707.36	9.19	701.14	No	700.08	7.99	701.93	No
15-Dec-93	706.10	9.47	700.86	No	699.70	8.19	701.73	No

Depths are presented in feet below top of inner casing.
Elevations are presented in feet relative to National Adjusted Vertical Datum (NAVD) 1929 Datum.
NR Elevations were not recorded.
Water elevations at stream gauges RG-4 and RG-5 are compared with the nearest wells, MW-6A and MW-7A respectively, for the purpose of determining possible groundwater flow reversals near the river.

Table 3-1. **Groundwater and Leachate Elevations, 12th Street Landfill Operable Unit, Plainwell, Michigan.**

Well/River Gauge No.:	MW-1		MW-2A		MW-2B		MW-3A	
Date Installed:	17-Aug-93		02-Aug-93		02-Aug-93		29-Jul-93	
Date Developed:	23-Aug-93		20-Aug-93		20-Aug-93		19-Aug-93	
Volume Developed (gal):	55		70		80		66	
Date Sampled:	10-Sep-93		08-Sep-93		08-Sep-93		14-Sep-93	
Date	Depth to Water	Elevation	Depth to Water	Elevation	Depth to Water	Elevation	Depth to Water	Elevation
31-Aug-93	6.68	702.03	5.93	701.38	5.26	701.71	3.68	700.57
03-Sep-93	6.44	702.27	5.82	701.49	5.01	701.96	3.41	700.84
12-Sep-93	6.69	702.02	5.97	701.34	5.15	701.82	3.75	700.50
28-Sep-93	6.40	702.31	5.69	701.62	4.96	702.01	3.42	700.83
15-Dec-93	6.55	702.16	5.83	701.48	5.12	701.85	3.59	700.66

Depths are presented in feet below top of inner casing.
Elevations are presented in feet relative to National Adjusted Vertical Datum (NAVD) 1929 Datum.
NR Elevations were not recorded.

Table 3-1. Groundwater and Leachate Elevations, 12th Street Landfill Operable Unit, Plainwell, Michigan.

Well/River Gauge No.:	MW-3B		MW-4A		MW-4B		MW-5A	
Date Installed:	29-Jul-93		29-Jul-93		28-Jul-93		02-Aug-93	
Date Developed:	19-Aug-93		18-Aug-93		18-Aug-93		20-Aug-93	
Volume Developed (gal):	85		24		176		60	
Date Sampled:	14-Sep-93		07-Sep-93		07-Sep-93		10-Sep-93	
Date	Depth to Water	Elevation	Depth to Water	Elevation	Depth to Water	Elevation	Depth to Water	Elevation
31-Aug-93	3.95	700.59	5.77	700.24	5.37	700.24	3.99	700.08
03-Sep-93	3.81	700.73	5.58	700.43	5.04	700.57	3.75	700.32
12-Sep-93	3.88	700.66	5.84	700.17	5.43	700.18	4.03	700.04
28-Sep-93	3.68	700.86	4.99	701.02	5.42	700.19	3.55	700.52
15-Dec-93	3.85	700.69	5.65	700.36	5.25	700.36	3.85	700.22

Depths are presented in feet below top of inner casing.
Elevations are presented in feet relative to National Adjusted Vertical Datum (NAVD) 1929 Datum.
NR Elevations were not recorded.

Table 3-1. Groundwater and Leachate Elevations, 12th Street Landfill Operable Unit, Plainwell, Michigan.

Well/River Gauge No.:	MW-5B		MW-6B		MW-7B		MW-8A	
Date Installed:	30-Jul-93		03-Aug-93		04-Aug-93		17-Aug-93	
Date Developed:	20-Aug-93		23-Aug-93		23-Aug-93		24-Aug-93	
Volume Developed (gal):	70		110		105		135	
Date Sampled:	10-Sep-93		09 Sep-93		13 Sep-93		13 Sep-93	
Date	Depth to Water	Elevation	Depth to Water	Elevation	Depth to Water	Elevation	Depth to Water	Elevation
31-Aug-93	3.93	700.25	9.60	700.61	9.21	701.61	32.61	702.35
03-Sep-93	3.66	700.52	9.34	700.87	9.02	701.80	32.13	702.83
12-Sep-93	3.87	700.31	9.53	700.68	9.16	701.66	32.61	702.35
28 Sep 93	3.44	700.74	9.14	701.07	8.92	701.90	32.44	702.52
15-Dec-93	3.75	700.43	9.43	700.78	9.16	701.66	32.58	702.38

Depths are presented in feet below top of inner casing.
Elevations are presented in feet relative to National Adjusted Vertical Datum (NAVD) 1929 Datum.
NR Elevations were not recorded.

Table 3-1. Groundwater and Leachate Elevations, 12th Street Landfill Operable Unit, Plainwell, Michigan.

Well/River Gauge No.:	MW-8B		LH-1		LH-2		LH-3	
Date Installed:	16-Aug-93		13-Aug-93		05-Aug-93		11-Aug-93	
Date Developed:	26-Aug-93		ND		ND		ND	
Volume Developed (gal):	135		ND		ND		ND	
Date Sampled:	13-Sep-93		16-Sep-93		16-Sep-93		15-Sep-93	
Date	Depth to Water	Elevation	Depth to Water	Elevation	Depth to Water	Elevation	Depth to Water	Elevation
31-Aug-93	32.61	702.28	9.00	718.30	5.43	723.48	13.94	714.44
03-Sep-93	32.49	702.40	9.11	718.19	5.32	723.59	13.92	714.46
12-Sep-93	32.61	702.28	9.41	717.89	6.24	722.67	13.43	714.95
28-Sep-93	32.63	702.26	9.64	717.66	5.43	723.48	14.03	714.35
15-Dec-93	32.59	702.30	9.91	717.39	5.52	723.39	14.00	714.38

Depths are presented in feet below top of inner casing.
Elevations are presented in feet relative to National Adjusted Vertical Datum (NAVD) 1929 Datum.
NR Elevations were not recorded.
ND Well was not developed.

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Table 3-2. Vertical Groundwater Hydraulic Gradient Values, 12th Street Landfill Operable Unit, Plainwell, Michigan.

Date	MW-2A/MW-2B Vertical Hydraulic Gradient	MW-3A/MW-3B Vertical Hydraulic Gradient	MW-4A/MW-4B Vertical Hydraulic Gradient	MW-5A/MW-5B Vertical Hydraulic Gradient	MW-6A/MW-6B Vertical Hydraulic Gradient	MW-7A/MW-7B Vertical Hydraulic Gradient	MW-8A/MW-8B Vertical Hydraulic Gradient
31-Aug-93	0.025	0.002	0	0.014	0.015	0.081	0.005
03 Sep-93	-0.035	0.011	-0.015	0.017	0.015	0.004	0.032
12-Sep-93	-0.036	-0.016	-0.001	-0.022	0.007	-0.007	0.005
28-Sep-93	0.029	-0.003	0.09	0.018	0.005	0.002	0.019
15-Dec-93	-0.028	-0.003	0	-0.017	0.006	0.005	0.006
Mean	-0.031	0.003	0.015	0.018	0.010	-0.015	0.013

Hydraulic gradients are presented for nested monitoring wells in feet/feet.

Positive gradient is downward in direction.

CI0091.001\TABLE3-2.WK1\VW

Table 3-3. In-Situ Hydraulic Conductivity Test Results
12th Street Landfill Operable Unit, Plainwell, Michigan.

Monitoring Well	Screened Interval (ft-msl)	Test	Hydraulic Conductivity (cm/sec)
MW-2A	700.45-690.45	Slug Out 1	1.7×10^{-2}
		Slug Out 2	1.1×10^{-2}
MW-2B	684.69-679.69	Slug Out 1	5.6×10^{-3}
		Slug Out 2	5.3×10^{-3}
MW-3A	697.75-692.75	Slug Out 1	1.0×10^{-2}
		Slug Out 2	9.3×10^{-3}
MW-3B	688.02-683.02	Slug Out 1	1.4×10^{-2}
		Slug Out 2	1.4×10^{-2}
MW-5A	699.61-689.61	Slug Out 1	6.3×10^{-3}
		Slug Out 2	6.6×10^{-3}
MW-5B	685.04-680.04	Slug Out 1	1.5×10^{-2}
		Slug Out 2	1.7×10^{-2}
MW-7A	704.38-694.38	Slug Out 1	3.3×10^{-2}
		Slug Out 2	2.7×10^{-2}
MW-7B	688.74-683.74	Slug Out 1	NA
		Slug Out 2	NA
MW-8A	706.15-696.15	Slug Out 1	1.2×10^{-1}
		Slug Out 2	1.2×10^{-1}
MW-8B	690.16-685.16	Slug Out 1	NA
		Slug Out 2	NA

Mean hydraulic conductivity value: 2.7×10^{-2} cm/sec.

NA Slug test data were not analyzable.
ft-msl Feet above mean sea level.
cm/sec Centimeters per second.
See Appendix E for slug test field data, computations, and plots.

C\0091.001\TABLE3-3.W51\VW

Table 3-4. Detected Compounds in Soil/Residuals - TCL Volatile Organic Compounds, July/August 1993, 12th Street Landfill Operable Unit, Plainwell, Michigan.

Sample Location:	SB-1	SB-1	SB-1 (Dup)	SB-2	SB-2	SB-4
Sample Depth:	26-28 ft	26-28 ft	26-28 ft	22-24 ft	22-24 ft	26-28 ft
Sample ID:	T90097	T90098	T90099	T90068	T90069	T90072
Sample Date:	08/13/93	08/13/93	08/13/93	08/05/93	08/05/93	08/10/93
Matrix:	Residuals	Soil	Soil	Residuals	Soil	Residuals
Units:	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
Parameter						
Acetone	0.14 J	0.053 J	0.016 J	2.5 EJ	0.038 J	0.069 J
Carbon disulfide	0.095 J	<0.011 J	<0.011 J	0.067 J	0.005 J	<0.10 J
2 Butanone	0.098 J	<0.011 J	<0.011 J	0.48 J	0.014 J	0.095 J
Benzene	<0.085 J	<0.011 J	<0.011 J	<0.088	<0.015	0.060 J
Tetrachloroethene	<0.085 J	<0.011 J	<0.011 J	0.018 J	<0.015	<0.10 J
Toluene	0.047 J	<0.011 J	<0.011 J	0.074 J	0.014 J	0.042 J
Ethylbenzene	0.059 J	<0.011 J	<0.011 J	0.090	0.008 J	0.059 J
Styrene	<0.085 J	<0.011 J	<0.011 J	0.041 J	<0.015	<0.10 J
Xylene (total)	0.35 J	<0.011 J	<0.011 J	0.18	0.010 J	0.39 J

mg/kg Milligrams per kilogram.
J Estimated value.
E Compound exceeded calibration range of the instrument.
D Compound determined at a secondary dilution factor.
ft Feet.
-- Not available.
Dup Duplicate.
MS/MSD This sample was designated as the matrix spike/matrix spike duplicate sample. This sample was also analyzed without the addition of the matrix spike/matrix spike duplicate compounds.

Table 3-4. Detected Compounds in Soil/Residuals - TCL Volatile Organic Compounds, July/August 1993, 12th Street Landfill Operable Unit, Plainwell, Michigan.

Sample Location:	SB-4	SB-5	SB-5	SB-6	SB-6 MS/MSD	SB-6
Sample Depth:	26-28 ft	20-22 ft	20-22 ft	20-22 ft	20-22 ft	24-26 ft
Sample ID:	T90073	T90089	T90090	T90085	T90086	T90087
Sample Date:	08/10/93	08/12/93	08/12/93	08/12/93	08/12/93	08/12/93
Matrix:	Soil	Soil (fill)	Soil	Residuals	Residuals	Soil
Units:	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
Parameter						
Acetone	0.62 J	0.023 J	<0.011 J	<2.1 J	<2.1 J	<0.010 J
Carbon disulfide	<0.13 J	<0.011 J	<0.011 J	<2.1 J	<2.1 J	<0.010 J
2-Butanone	0.17 J	<0.011 J	<0.011 J	<2.1 J	<2.1 J	<0.010 J
Benzene	<0.13 J	<0.011 J	<0.011 J	<2.1 J,K	<2.1 J,K	<0.010 J
Tetrachloroethene	<0.13 J	<0.011 J	<0.011 J	<2.1 J	<2.1 J	<0.010 J
Toluene	<0.13 J	<0.011 J	<0.011 J	<2.1 J	<2.1 J	<0.010 J
Ethylbenzene	<0.13 J	<0.011 J	<0.011 J	<2.1 J	<2.1 J	<0.010 J
Styrene	<0.13 J	<0.011 J	<0.011 J	<2.1 J,K	<2.1 J,K	<0.010 J
Xylene (total)	0.18 J	<0.011 J	<0.011 J	<2.1 J	<2.1 J	<0.010 J

mg/kg Milligrams per kilogram.
J Estimated value.
E Compound exceeded calibration range of the instrument.
D Compound determined at a secondary dilution factor.
ft Feet.
-- Not available.
Dup Duplicate.
MS/MSD This sample was designated as the matrix spike/matrix spike duplicate sample. This sample was also analyzed without the addition of the matrix spike/matrix spike duplicate compounds.

Table 3-4. Detected Compounds in Soil/Residuals - TCL Volatile Organic Compounds, July/August 1993, 12th Street Landfill Operable Unit, Plainwell, Michigan.

Sample Location:	MS/MSD SB-6	SB-7	SB-7 (Dup)	SB-7	DB-1	DB-2
Sample Depth:	24-26 ft	24-26 ft	24-26 ft	24-26 ft	1-2 ft	0-1 ft
Sample ID:	T90088	T90078	T90079	T90080	T90000	T90002
Sample Date:	08/12/93	08/12/93	08/12/93	08/12/93	07/20/93	07/20/93
Matrix:	Soil	Residuals	Residuals	Soil	Soil	Soil
Units:	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
Parameter						
Acetone	<0.011 J	<2.6 J	0.32 J	0.90 DJ	0.11 J	<0.012 J
Carbon disulfide	<0.011 J	<2.6 J	0.019 J	0.035 J	<0.011	<0.012 J
2-Butanone	<0.011 J	<2.6 J	0.55 J	0.29 J	0.012	<0.012 J
Benzene	<0.011 J	<2.6 J ok	0.041 J	0.046 J	<0.011	<0.012 J
Tetrachloroethene	<0.011 J	<2.6 J	0.022 J	<0.026 J	<0.011	<0.012 J
Toluene	<0.011 J	<2.6 J	0.083 J	<0.026 J	0.003 J	<0.012 J
Ethylbenzene	<0.011 J	<2.6 J	0.12 J	0.029 J	<0.011	<0.012 J
Styrene	<0.011 J	<2.6 J ok	<0.12 J	<0.026 J	<0.011	<0.012 J
Xylene (total)	<0.011 J	1.3 J	1.50 J	0.16 J	<0.011	<0.012 J

mg/kg Milligrams per kilogram.
J Estimated value.
E Compound exceeded calibration range of the instrument.
D Compound determined at a secondary dilution factor.
ft Feet.
-- Not available.
Dup Duplicate.
MS/MSD This sample was designated as the matrix spike/matrix spike duplicate sample. This sample was also analyzed without the addition of the matrix spike/matrix spike duplicate compounds.

Table 3-4. Detected Compounds in Soil/Residuals - TCL Volatile Organic Compounds, July/August 1993, 12th Street Landfill Operable Unit, Plainwell, Michigan.

Sample Location:	DB-3	DB-4	DB-5	DB-6	DB-7	DB-8
Sample Depth:	4-5 ft	1-2 ft	--	0-1 ft	--	0-1 ft
Sample ID:	T90004	T90005	T90008	T90006	T90013	T90010
Sample Date:	07/21/93	07/21/93	07/21/93	07/21/93	07/21/93	07/21/93
Matrix:	Soil	Soil	Soil	Soil	Soil	Soil
Units:	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
Parameter						
Acetone	0.29 J	0.28 J	0.12 J	0.044 J	0.086 J	0.082 J
Carbon disulfide	0.017 J	<0.091 J	<0.016	<0.015	<0.013	<0.015
2-Butanone	0.065 J	<0.091 J	<0.016	<0.015	<0.013	<0.015
Benzene	<0.067 J	<0.091 J	<0.016	<0.015	<0.013	<0.015
Tetrachloroethene	<0.067 J	<0.091 J	<0.016	<0.015	<0.013	<0.015
Toluene	<0.067 J	<0.091 J	<0.016	<0.015	<0.013	<0.015
Ethylbenzene	<0.067 J	<0.091 J	<0.016	<0.015	<0.013	<0.015
Styrene	<0.067 J	<0.091 J	<0.016	<0.015	<0.013	<0.015
Xylene (total)	<0.067 J	<0.091 J	<0.016	<0.015	<0.013	<0.015

mg/kg Milligrams per kilogram.
J Estimated value.
E Compound exceeded calibration range of the instrument.
D Compound determined at a secondary dilution factor.
ft Feet.
-- Not available.
Dup Duplicate.
MS/MSD This sample was designated as the matrix spike/matrix spike duplicate sample. This sample was also analyzed without the addition of the matrix spike/matrix spike duplicate compounds.

Table 3-4. Detected Compounds in Soil/Residuals - TCL Volatile Organic Compounds, July/August 1993, 12th Street Landfill Operable Unit, Plainwell, Michigan.

Sample Location:	DB-8 (Dup)	DB-9	DB-10	DB-11	DB-12	DB-12 (Dup)
Sample Depth:	0-1 ft	--	0-1 ft	--	0-1 ft	0-1 ft
Sample ID:	190012	190016	190014	190021	190018	190019
Sample Date:	07/21/93	07/21/93	07/21/93	07/22/93	07/22/93	07/22/93
Matrix:	Soil	Soil	Soil	Soil	Soil	Soil
Units:	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
Parameter						
Acetone	0.029	0.18	0.098 J	0.047 J	<0.012 J	<0.012 J
Carbon disulfide	<0.014	<0.013	<0.025 J	0.007 J	<0.012 J	<0.012 J
2-Butanone	<0.014	<0.013	<0.025 J	<0.013 J	<0.012 J	<0.012 J
Benzene	<0.014	<0.013	<0.025 J	<0.013 J	<0.012 J	<0.012 J
Tetrachloroethene	<0.014	<0.013	<0.025 J	<0.013 J	<0.012 J	<0.012 J
Toluene	<0.014	<0.013	<0.025 J	<0.013 J	<0.012 J	<0.012 J
Ethylbenzene	<0.014	<0.013	<0.025 J	<0.013 J	<0.012 J	<0.012 J
Styrene	<0.014	<0.013	<0.025 J	<0.013 J	<0.012 J	<0.012 J
Xylene (total)	<0.014	<0.013	<0.025 J	<0.013 J	<0.012 J	<0.012 J

mg/kg Milligrams per kilogram.
J Estimated value.
E Compound exceeded calibration range of the instrument.
D Compound determined at a secondary dilution factor.
ft Feet.
-- Not available.
Dup Duplicate.
MS/MSD This sample was designated as the matrix spike/matrix spike duplicate sample. This sample was also analyzed without the addition of the matrix spike/matrix spike duplicate compounds.

Table 3-4. Detected Compounds in Soil/Residuals - TCL Volatile Organic Compounds, July/August 1993, 12th Street Landfill Operable Unit, Plainwell, Michigan.

Sample Location:	DB-13	DB-14	MW-1	MW-1	MW-2B	MW-2B
Sample Depth:	--	0-1 ft	6-8 ft	6-8 ft	3-5 ft	5-6 ft
Sample ID:	T90024	T90025	T90105	T90106	T90029	T90030
Sample Date:	07/22/93	07/22/93	08/17/93	08/17/93	07/30/93	07/30/93
Matrix:	Soil	Soil	Residuals	Soil	Residuals	Soil
Units:	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
Parameter						
Acetone	<0.010 J	<0.014 J	<0.43 J	0.83 J	0.18 J	0.20 J
Carbon disulfide	<0.010 J	<0.014 J	<0.015 J	0.018 J	0.018 J	0.019 J
2-Butanone	<0.010 J	<0.014 J	<0.015 J	0.21 J	<0.10 J	0.020 J
Benzene	<0.010 J	<0.014 J	<0.015 J	0.009 J	<0.10 J	<0.034 J
Tetrachloroethene	<0.010 J	<0.014 J	<0.015 J	<0.042 J	<0.10 J	<0.034 J
Toluene	<0.010 J	<0.014 J	<0.015 J	0.006 J	<0.10 J	<0.034 J
Ethylbenzene	<0.010 J	<0.014 J	<0.015 J	0.04 J	<0.10 J	<0.034 J
Styrene	<0.010 J	<0.014 J	<0.015 J	<0.042 J	<0.10 J	<0.034 J
Xylene (total)	<0.010 J	<0.014 J	<0.015 J	0.26 J	0.220 J	0.013 J

mg/kg Milligrams per kilogram.
J Estimated value.
E Compound exceeded calibration range of the instrument.
D Compound determined at a secondary dilution factor.
ft Feet.
-- Not available.
Dup Duplicate.
MS/MSD This sample was designated as the matrix spike/matrix spike duplicate sample. This sample was also analyzed without the addition of the matrix spike/matrix spike duplicate compounds.

Table 3-4. Detected Compounds in Soil/Residuals - TCL Volatile Organic Compounds, July/August 1993, 12th Street Landfill Operable Unit, Plainwell, Michigan.

Sample Location:	MW-3B	MW-3B	MW-4B	MW-4B	MW-5B	MW-5B
Sample Depth:	2-4 ft	2-4 ft	2-4 ft	2-4 ft	0-2 ft	0-2 ft
Sample ID:	T90032	T90033	T90027	T90028	T90036	T90039
Sample Date:	07/30/93	07/30/93	08/03/93	08/03/93	07/30/93	07/30/93
Matrix:	Soil	Residuals	Soil	Residuals	Soil	Residuals
Units:	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
Parameter						
Acetone	0.38 J	0.15 J	<0.016 J	<0.014	0.026 J	0.036
Carbon disulfide	<0.032 J	<0.096	<0.016 J	<0.014	<0.014 J	<0.017
2-Butanone	0.15 J	<0.096	<0.016 J	<0.014	<0.014 J	<0.017
Benzene	<0.032 J	<0.096	<0.016 J	<0.014 J	<0.014 J	<0.017
Tetrachloroethene	<0.032 J	<0.096	<0.016 J	<0.014 J	<0.014 J	<0.017 J
Toluene	<0.032 J	<0.096	<0.016 J	<0.014 J	<0.014 J	<0.017 J
Ethylbenzene	<0.032 J	<0.096	<0.016 J	<0.014 J	<0.014 J	<0.017 J
Styrene	<0.032 J	<0.096	<0.016 J	<0.014 J	<0.014 J	<0.017 J
Xylene (total)	<0.032 J	<0.096	<0.016 J	<0.014 J	<0.014 J	<0.017 J

mg/kg Milligrams per kilogram.
J Estimated value.
E Compound exceeded calibration range of the instrument.
D Compound determined at a secondary dilution factor.
ft Feet.
-- Not available.
Dup Duplicate.
MS/MSD This sample was designated as the matrix spike/matrix spike duplicate sample. This sample was also analyzed without the addition of the matrix spike/matrix spike duplicate compounds.

Table 3-4. Detected Compounds in Soil/Residuals - TCL Volatile Organic Compounds, July/August 1993, 12th Street Landfill Operable Unit, Plainwell, Michigan.

Sample Location:	MW-6B	MW-7B	MW-8B
Sample Depth:	6-8 ft	8-10 ft	30-32 ft
Sample ID:	T90043	T90046	T90103
Sample Date:	08/03/93	08/05/93	08/17/93
Matrix:	Soil	Soil	Soil
Units:	mg/kg	mg/kg	mg/kg
Parameter			
Acetone	<0.011 J	0.003 J	<0.011 J
Carbon disulfide	<0.011 J	<0.011 J	<0.011 J
2-Butanone	<0.011 J	<0.011 J	<0.011 J
Benzene	<0.011 J	<0.011 J	<0.011 J
Tetrachloroethene	<0.011 J	<0.011 J	<0.011 J
Toluene	<0.011 J	<0.011 J	<0.011 J
Ethylbenzene	<0.011 J	<0.011 J	<0.011 J
Styrene	<0.011 J	<0.011 J	<0.011 J
Xylene (total)	<0.011 J	<0.011 J	<0.011 J

mg/kg Milligrams per kilogram.
J Estimated value.
E Compound exceeded calibration range of the instrument.
D Compound determined at a secondary dilution factor.
ft Feet.
-- Not available.
Dup Duplicate.
MS/MSD This sample was designated as the matrix spike/matrix spike duplicate sample. This sample was also analyzed without the addition of the matrix spike/matrix spike duplicate compounds.

Table 3-5. Detected Compounds in Soil/Residuals - Semivolatile Organic Compounds, July/August 1993, 12th Street Landfill Operable Unit, Plainwell, Michigan.

Sample Location:	SB-1	SB-1	SB-1 (Dup)	SB-2	SB-2	SB-4
Sample Depth:	26-28 ft	26-28 ft	26-28 ft	22-24 ft	22-24 ft	26-28 ft
Sample ID:	T90097	T90098	T90099	T90068	T90069	T90072
Sample Date:	08/13/93	08/13/93	08/13/93	08/05/93	08/05/93	08/10/93
Matrix:	Residuals	Soil	Soil	Residuals	Soil	Residuals
Units:	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
Parameter						
4-Methylphenol	<3 J	<0.36	<0.36	<5.9	<2.0	<70 ok
Naphthalene	<3 J	<0.36	<0.36	0.56 J	0.13 J	<70
2-Methylnaphthalene	11 J ok	0.031 J	<0.36	<5.9	0.19 J	17 J ok
2,4,6-Trichlorophenol	<3 J ok	<0.36	<0.36	<5.9 ok	<2.0	<70 ok
2,4,5-Trichlorophenol	<81 J	<0.86	<0.86	5.8 J	<4.8	<170
Diethylphthalate	<3 J	<0.36	<0.36	<5.9	<2.0	<70
Pentachlorophenol	<81 J	<0.86 ok	<0.86 ok	13 J ok	<4.8 ok	<170
Phenanthrene	<3 J ok	<0.36	<0.36	<5.9	<2.0	<70
Anthracene	<3 J	<0.36	<0.36	<5.9	<2.0	<70
Carbazole	<3 J	<0.36	<0.36	<5.9	<2.0	<70
Di-n-butylphthalate	<3 J	<0.36	<0.36	<5.9	<2.0	<70
Fluoranthene	<3 J	<0.36	<0.36	<5.9	<2.0	<70
Pyrene	<3 J	<0.36	<0.36	<5.9	<2.0	<70
Benzo(a)anthracene	<3 J	<0.36	<0.36	<5.9	<2.0	<70
Chrysene	<3 J	<0.36	<0.36	<5.9	<2.0	<70
bis(2-Ethylhexyl)phthalate	<3 J ok	<0.50	<0.68	<5.9 ok	<2.0	<70 ok
Benzo(b)fluoranthene	<3 J	<0.36	<0.36	<5.9	<2.0	<70
Benzo(k)fluoranthene	<3 J	<0.36	<0.36	<5.9	<2.0	<70
Benzo(a)pyrene	<3 J	<0.36	<0.36	<5.9	<2.0	<70
Indeno(1,2,3-cd)pyrene	<3 J	<0.36	<0.36	<5.9	<2.0	<70
Benzo(g,h,i)perylene	<3 J ok	<0.36	<0.36	<5.9	<2.0	<70 ok

mg/kg	Milligrams per kilogram.
ft	Feet.
—	Not available.
J	Estimated value.
Dup	Duplicate.
MS/MSD	This sample was designated as the matrix spike/matrix spike duplicate sample. This sample was also analyzed without the addition of the matrix spike/matrix spike duplicate compounds.

Table 3-5. Detected Compounds in Soil/Residuals - Semivolatile Organic Compounds, July/August 1993, 12th Street Landfill Operable Unit, Plainwell, Michigan.

Sample Location:	SB-4	SB-5	SB-5	SB-6	MS/MSD SB-6	SB-6
Sample Depth:	26-28 ft	20-22 ft	20-22 ft	20-22 ft	20-22 ft	24-26 ft
Sample ID:	T90073	T90089	T90090	T90085	T90086	T90087
Sample Date:	08/10/93	08/12/93	08/12/93	08/12/93	08/12/93	08/12/93
Matrix:	Soil	Soil (fill)	Soil	Residuals	Residuals	Soil
Units:	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
Parameter						
4-Methylphenol	<0.74 J	<0.36	<0.36	1.8 J	<14 J	<0.35
Naphthalene	<0.74 J	<0.36	<0.36	<12 J	<14 J	<0.35
2-Methylnaphthalene	<0.74 J	<0.36	<0.36	3.2 J	2.6 J	<0.35
2,4,6-Trichlorophenol	<0.74 J	<0.36	<0.36	<12 J	<14 J	<0.35
2,4,5-Trichlorophenol	<1.8 J	<0.88	<0.87	<30 J	<34 J	<0.84
Diethylphthalate	<0.74 J	<0.36	<0.36	<12 J	<14 J	<0.35
Pentachlorophenol	<1.8 J	<0.88	<0.87	<30 J	<34 J	<0.84
Phenanthrene	<0.74 J	<0.36	<0.36	<12 J	<14 J	<0.35
Anthracene	<0.74 J	<0.36	<0.36	<12 J	<14 J	<0.35
Carbazole	<0.74 J	<0.36	<0.36	<12 J	<14 J	<0.35
Di-n-butylphthalate	<0.74 J	<0.36	<0.36	<12 J	<14 J	<0.35
Fluoranthene	<0.74 J	<0.36	<0.36	<12 J	<14 J	<0.35
Pyrene	<0.74 J	<0.36	<0.36	<12 J	<14 J	<0.35
Benzo(a)anthracene	<0.74 J	<0.36	<0.36	<12 J	<14 J	<0.35
Chrysene	<0.74 J	<0.36	<0.36	<12 J	<14 J	<0.35
bis(2-Ethylhexyl)phthalate	<0.74 J	<0.36	<0.36	<12 J	<14 J	<0.35
Benzo(b)fluoranthene	<0.74 J	<0.36	<0.36	<12 J	<14 J	<0.35
Benzo(k)fluoranthene	<0.74 J	<0.36	<0.36	<12 J	<14 J	<0.35
Benzo(a)pyrene	<0.74 J	<0.36	<0.36	<12 J	<14 J	<0.35
Indeno(1,2,3-cd)pyrene	<0.74 J	<0.36	<0.36	<12 J	<14 J	<0.35
Benzo(g,h,i)perylene	<0.74 J	<0.36	<0.36	<12 J	<14 J	<0.35

mg/kg	Milligrams per kilogram.
ft	Feet.
--	Not available.
J	Estimated value.
Dup	Duplicate.
MS/MSD	This sample was designated as the matrix spike/matrix spike duplicate sample. This sample was also analyzed without the addition of the matrix spike/matrix spike duplicate compounds.

Table 3-5. Detected Compounds in Soil/Residuals - Semivolatile Organic Compounds, July/August 1993, 12th Street Landfill Operable Unit, Plainwell, Michigan.

Sample Location:	MS/MSD SB-6	SB-7	SB-7 (Dup)	SB-7	DB-1	DB-2
Sample Depth:	24-26 ft	24-26 ft	24-26 ft	24-26 ft	1-2 ft	0-1 ft
Sample ID:	T90088	T90078	T90079	T90080	T90000	T90002
Sample Date:	08/12/93	08/12/93	08/12/93	08/12/93	07/20/93	07/20/93
Matrix:	Soil	Residuals	Residuals	Soil	Soil	Soil
Units:	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
Parameter						
4-Methylphenol	<0.35	5.9 J	6.5 J	<17 J	0.022 J	<0.40
Naphthalene	<0.35	<89 J	<78 J	<17 J	<0.38	<0.40
2-Methylnaphthalene	<0.35	12 J	14 J	2.1 J	<0.38	<0.40
2,4,6-Trichlorophenol	<0.35	<89 J	<78 J	<17 J	<0.38	<0.40
2,4,5-Trichlorophenol	<0.84	<220 J	<190 J	<41 J	<0.93	<0.98
Diethylphthalate	<0.35	<89 J	<78 J	<17 J	<0.38	<0.40
Pentachlorophenol	<0.84	<220 J	<190 J	<41 J	<0.93	<0.98
Phenanthrene	<0.35	<89 J	<78 J	<17 J	0.12 J	<0.40
Anthracene	<0.35	<89 J	<78 J	<17 J	0.027 J	<0.40
Carbazole	<0.35	<89 J	<78 J	<17 J	0.019 J	<0.40 J
Di-n-butylphthalate	<0.35	<89 J	<78 J	<17 J	<0.38	<0.40
Fluoranthene	<0.35	<89 J	<78 J	<17 J	0.16 J	0.027 J
Pyrene	<0.35	<89 J	<78 J	<17 J	0.12 J	0.027 J
Benzo(a)anthracene	<0.35	<89 J	<78 J	<17 J	0.059 J	<0.40
Chrysene	<0.35	<89 J	<78 J	<17 J	0.089 J	0.020 J
bis(2-Ethylhexyl)phthalate	<0.35	<89 J	<78 J	<17 J	<0.38	<0.40
Benzo(b)fluoranthene	<0.35	<89 J	<78 J	<17 J	0.081 J	<0.40
Benzo(k)fluoranthene	<0.35	<89 J	<78 J	<17 J	0.084 J	<0.40
Benzo(a)pyrene	<0.35	<89 J	<78 J	<17 J	0.085 J	<0.40
Indeno(1,2,3-cd)pyrene	<0.35	<89 J	<78 J	<17 J	0.066 J	<0.40
Benzo(g,h,i)perylene	<0.35	<89 J	<78 J	<17 J	<0.38	0.032 J

mg/kg	Milligrams per kilogram.
ft	Feet.
—	Not available.
J	Estimated value.
Dup	Duplicate.
MS/MSD	This sample was designated as the matrix spike/matrix spike duplicate sample. This sample was also analyzed without the addition of the matrix spike/matrix spike duplicate compounds.

Table 3-5. Detected Compounds in Soil/Residuals - Semivolatile Organic Compounds, July/August 1993, 12th Street Landfill Operable Unit, Plainwell, Michigan.

Sample Location:	DB-3	DB-4	DB-5	DB-6	DB-7	DB-8
Sample Depth:	4-5 ft	1-2 ft	--	0-1 ft	--	0-1 ft
Sample ID:	T90004	T90005	T90008	T90006	T90013	T90010
Sample Date:	07/21/93	07/21/93	07/21/93	07/21/93	07/21/93	07/21/93
Matrix:	Soil	Soil	Soil	Soil	Soil	Soil
Units:	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
Parameter						
4-Methylphenol	<4.1 J	<2.7 J	<2.0 J	<0.58	<0.48	<0.56
Naphthalene	<4.1 J	<2.7 J	<2.0 J	<0.58	<0.48	<0.56
2-Methylnaphthalene	<4.1 J	<2.7 J	0.12 J	<0.58	<0.48	<0.56
2,4,6-Trichlorophenol	<4.1 J	<2.7 J	<2.0 J	<0.58	<0.48	<0.56
2,4,5-Trichlorophenol	<10 J	<6.6 J	<4.8 J	<1.4	<1.2	<1.4
Diethylphthalate	<4.1 J	<2.7 J	<2.0 J	<0.58	<0.48	<0.56
Pentachlorophenol	<10 J	<6.6 J	<4.8 J	<1.4	<1.2	<1.4
Phenanthrene	<4.1 J	<2.7 J	<2.0 J	<0.58	0.058 J	<0.56
Anthracene	<4.1 J	<2.7 J	<2.0 J	<0.58	<0.48	<0.56
Carbazole	<4.1 J	<2.7 J	<2.0 J	<0.58 J	<0.48 J	<0.56 J
Di-n-butylphthalate	<4.1 J	<2.7 J	<2.0 J	<0.58	<0.48	<0.56
Fluoranthene	<4.1 J	<2.7 J	0.16 J	<0.58	0.130 J	<0.56
Pyrene	<4.1 J	<2.7 J	0.15 J	<0.58	0.120 J	<0.56
Benzo(a)anthracene	<4.1 J	<2.7 J	<2.0 J	<0.58	0.084 J	<0.56
Chrysene	<4.1 J	<2.7 J	<2.0 J	<0.58	0.099 J	<0.56
bis(2-Ethylhexyl)phthalate	<4.1 J	<2.7 J	<2.0 J	<0.58	<0.48	<0.56
Benzo(b)fluoranthene	<4.1 J	<2.7 J	0.11 J	<0.58	0.080 J	<0.56
Benzo(k)fluoranthene	<4.1 J	<2.7 J	0.10 J	<0.58	0.081 J	<0.56
Benzo(a)pyrene	<4.1 J	<2.7 J	0.10 J	<0.58	0.094 J	<0.56
Indeno(1,2,3-cd)pyrene	<4.1 J	<2.7 J	<2.0 J	<0.58	0.027 J	<0.56
Benzo(g,h,i)perylene	<4.1 J	<2.7 J	<2.0 J	<0.58	<0.48	<0.56

mg/kg	Milligrams per kilogram.
ft	Feet.
—	Not available.
J	Estimated value.
Dup	Duplicate.
MS/MSD	This sample was designated as the matrix spike/matrix spike duplicate sample. This sample was also analyzed without the addition of the matrix spike/matrix spike duplicate compounds.

Table 3-5. Detected Compounds in Soil/Residuals - Semivolatile Organic Compounds, July/August 1993, 12th Street Landfill Operable Unit, Plainwell, Michigan.

Sample Location:	DB-8 (Dup)	DB-9	DB-10	DB-11	DB-12	DB-12 (Dup)
Sample Depth:	0-1 ft	--	0-1 ft	--	0-1 ft	0-1 ft
Sample ID:	T90012	T90016	T90014	T90021	T90018	T90019
Sample Date:	07/21/93	07/21/93	07/21/93	07/22/93	07/22/93	07/22/93
Matrix:	Soil	Soil	Soil	Soil	Soil	Soil
Units:	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
Parameter						
4-Methylphenol	<0.46	<0.44	<0.73 J	<0.42	<0.41	<0.41
Naphthalene	<0.46	<0.44	<0.73 J	<0.42	<0.41	<0.41
2-Methylnaphthalene	<0.46	<0.44	<0.73 J	<0.42	<0.41	<0.41
2,4,6-Trichlorophenol	<0.46	<0.44	<0.73 J	<0.42	<0.41	<0.41
2,4,5-Trichlorophenol	<1.1	<1.1	<1.8 J	<1.0	<1.0	<0.98
Diethylphthalate	<0.46	<0.44	<0.73 J	<0.42	<0.41	<0.41
Pentachlorophenol	<1.1	<1.1	<1.8 J	<1.0	<1.0	<0.98
Phenanthrene	<0.46	0.044 J	0.18 J	<0.42	<0.41	<0.41
Anthracene	<0.46	0.020 J	0.065 J	<0.42	<0.41	<0.41
Carbazole	<0.46 J	<0.44 J	<0.73 J	<0.42	<0.41	<0.41
Di-n-butylphthalate	<0.46	<0.44	0.040 J	<0.42	<0.41	<0.41
Fluoranthene	<0.46	0.13 J	0.39 J	<0.42	<0.41	<0.41
Pyrene	<0.46	0.12 J	0.34 J	<0.42 J	<0.41 J	<0.41 J
Benzo(a)anthracene	<0.46	0.086 J ok	0.21 J	<0.42	<0.41	<0.41
Chrysene	<0.46	0.085 J ok	0.25 J	<0.42	<0.41	<0.41
bis(2-Ethylhexyl)phthalate	<0.46	<0.44	<0.73 J	<0.42	<0.41	<0.41
Benzo(b)fluoranthene	<0.46	0.062 J ok	0.20 J	<0.42	<0.41	<0.41
Benzo(k)fluoranthene	<0.46	0.076 J ok	0.22 J	<0.42	<0.41	<0.41
Benzo(a)pyrene	<0.46	0.075 J ok	0.20 J	<0.42	<0.41	<0.41
Indeno(1,2,3-cd)pyrene	<0.46	<0.44	<0.73 J	<0.42	<0.41	<0.41
Benzo(g,h,i)perylene	<0.46	<0.44	<0.73 J	<0.42	<0.41	<0.41

mg/kg	Milligrams per kilogram.
ft	Feet.
--	Not available.
J	Estimated value.
Dup	Duplicate.
MS/MSD	This sample was designated as the matrix spike/matrix spike duplicate sample. This sample was also analyzed without the addition of the matrix spike/matrix spike duplicate compounds.

Table 3-5. Detected Compounds in Soil/Residuals - Semivolatile Organic Compounds, July/August 1993, 12th Street Landfill Operable Unit, Plainwell, Michigan.

Sample Location:	DB-13	DB-14	MW-1	MW-1	MW-2B	MW-2B
Sample Depth:	--	0-1 ft	6-8 ft	6-8 ft	3-5 ft	5-6 ft
Sample ID:	T90024	T90025	T90105	T90106	T90029	T90030
Sample Date:	07/22/93	07/22/93	08/17/93	08/17/93	07/30/93	07/30/93
Matrix:	Soil	Soil	Residuals	Soil	Residuals	Soil
Units:	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
Parameter						
4-Methylphenol	<0.35	<0.49	<1.2 J	<1.3 J	<1.2 J	<1.6 J
Naphthalene	<0.35	<0.49	<1.2 J	<1.3 J	0.092 J	<1.6 J
2-Methylnaphthalene	<0.35	<0.49	<1.2 J	<1.3 J	0.31 J	<1.6 J
2,4,6-Trichlorophenol	<0.35	<0.49	<1.2 J	<1.3 J	<1.2 J	<1.6 J
2,4,5-Trichlorophenol	<0.85	<1.2	<2.8 J	<3.1 J	<2.8 J	<4.0 J
Diethylphthalate	<0.35	<0.49	<1.2 J	0.070 J	<1.2 J	<1.6 J
Pentachlorophenol	<0.85	<1.2	<2.8 J	<3.1 J	<2.8 J	<4.0 J
Phenanthrene	<0.35	<0.49	<1.2 J	<1.3 J	0.064 J	<1.6 J
Anthracene	<0.35	<0.49	<1.2 J	<1.3 J	<1.2 J	<1.6 J
Carbazole	<0.35	<0.49	<1.2 J	<1.3 J	<1.2 J	<1.6 J
Di-n-butylphthalate	0.026 J	0.026 J	<1.2 J	<1.3 J	<1.2 J	<1.6 J
Fluoranthene	<0.35	0.038 J	<1.2 J	0.12 J	0.070 J	<1.6 J
Pyrene	<0.35 J	0.036 J	<1.2 J	0.27 J	0.23 J	<1.6 J
Benzo(a)anthracene	<0.35	<0.49	<1.2 J	<1.3 J	0.064 J	<1.6 J
Chrysene	<0.35	0.030 J ok	<1.2 J	<1.3 J	0.084 J	<1.6 J
bis(2-Ethylhexyl)phthalate	<0.35	<0.49	<1.2 J	<1.3 J	0.46 J	<1.6 J
Benzo(b)fluoranthene	<0.35	<0.49	<1.2 J	<1.3 J	<1.2 J	<1.6 J
Benzo(k)fluoranthene	<0.35	<0.49	<1.2 J	<1.3 J	<1.2 J	<1.6 J
Benzo(a)pyrene	<0.35	<0.49	<1.2 J	<1.3 J	<1.2 J	<1.6 J
Indeno(1,2,3-cd)pyrene	<0.35	<0.49	<1.2 J	<1.3 J	<1.2 J	<1.6 J
Benzo(g,h,i)perylene	<0.35 J	<0.49 J	<1.2 J	<1.3 J	<1.2 J	<1.6 J

mg/kg	Milligrams per kilogram.
ft	Feet.
--	Not available.
J	Estimated value.
Dup	Duplicate.
MS/MSD	This sample was designated as the matrix spike/matrix spike duplicate sample. This sample was also analyzed without the addition of the matrix spike/matrix spike duplicate compounds.

Table 3-5. Detected Compounds in Soil/Residuals - Semivolatile Organic Compounds, July/August 1993, 12th Street Landfill Operable Unit, Plainwell, Michigan.

Sample Location:	MW-3B	MW-3B	MW-4B	MW-4B	MW-5B	MW-5B
Sample Depth:	2-4 ft	2-4 ft	2-4 ft	2-4 ft	0-2 ft	0-2 ft
Sample ID:	T90032	T90033	T90027	T90028	T90036	T90039
Sample Date:	07/30/93	07/30/93	08/03/93	08/03/93	07/30/93	07/30/93
Matrix:	Soil	Residuals	Soil	Residuals	Soil	Residuals
Units:	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
Parameter						
4-Methylphenol	<0.39	<1.2	<2.1	<0.68	<0.40	<1.8
Naphthalene	<0.39	0.081 J	<2.1	<0.68	<0.40	<1.8
2-Methylnaphthalene	0.047 J	0.24 J	<2.1	<0.68	<0.40	<1.8
2,4,6-Trichlorophenol	<0.39	<1.2	<2.1	0.26 J	<0.40	<1.8
2,4,5-Trichlorophenol	<0.95	<2.8	<5.1	<1.6	<0.97	<4.5
Diethylphthalate	<0.39	<1.2	<2.1 J	0.46 J	<0.40	<1.8
Pentachlorophenol	<0.95	<2.8	<5.1	<1.6	<0.97	<4.5
Phenanthrene	<0.39	<1.2	<2.1	<0.68	<0.40	<1.8
Anthracene	<0.39	<1.2	<2.1	<0.68	<0.40	<1.8
Carbazole	<0.39	<1.2	<2.1	<0.68	<0.40	<1.8
Di-n-butylphthalate	<0.39	<1.2	<2.1	0.054 J	<0.40	<1.8
Fluoranthene	<0.39	0.085 J	<2.1	<0.68	<0.40	<1.8
Pyrene	<0.39	0.13 J	<2.1	<0.68	<0.40	<1.8
Benzo(a)anthracene	<0.39	<1.2	<2.1	<0.68	<0.40	<1.8
Chrysene	<0.39	0.058 J	<2.1	<0.68	<0.40	<1.8
bis(2-Ethylhexyl)phthalate	<0.39	0.36 J	<2.1	<0.68	<0.40	0.095 J
Benzo(b)fluoranthene	<0.39	<1.2	<2.1	<0.68	<0.40	<1.8
Benzo(k)fluoranthene	<0.39	<1.2	<2.1	<0.68	<0.40	<1.8
Benzo(a)pyrene	<0.39	<1.2	<2.1	<0.68	<0.40	<1.8
Indeno(1,2,3-cd)pyrene	<0.39	<1.2	<2.1	<0.68	<0.40	<1.8
Benzo(g,h,i)perylene	<0.39	<1.2 J	<2.1	<0.68	<0.40	<1.8 J

mg/kg	Milligrams per kilogram.
ft	Feet.
—	Not available.
J	Estimated value.
Dup	Duplicate.
MS/MSD	This sample was designated as the matrix spike/matrix spike duplicate sample. This sample was also analyzed without the addition of the matrix spike/matrix spike duplicate compounds.

Table 3-5. Detected Compounds in Soil/Residuals - Semivolatile Organic Compounds, July/August 1993, 12th Street Landfill Operable Unit, Plainwell, Michigan.

Sample Location:	MW-6B	MW-7B	MW-8B
Sample Depth:	6-8 ft	8-10 ft	30-32 ft
Sample ID:	T90043	T90046	T90103
Sample Date:	08/03/93	08/05/93	08/17/93
Matrix:	Soil	Soil	Soil
Units:	mg/kg	mg/kg	mg/kg
Parameter			
4-Methylphenol	<0.38	<0.38	<0.36
Naphthalene	<0.38	<0.38	<0.36
2-Methylnaphthalene	<0.38	<0.38	<0.36
2,4,6-Trichlorophenol	<0.38	<0.38	<0.36
2,4,5-Trichlorophenol	<0.91	<0.98	<0.86 J
Diethylphthalate	<0.38 J	<0.38	<0.36
Pentachlorophenol	<0.91	<0.98	<0.86
Phenanthrene	<0.38	<0.38	<0.36
Anthracene	<0.38	<0.38	<0.36
Carbazole	<0.38	<0.38	<0.36
Di-n-butylphthalate	<0.38	<0.38	<0.36
Fluoranthene	<0.38	<0.38	<0.36
Pyrene	<0.38	<0.38	<0.36
Benzo(a)anthracene	<0.38	<0.38	<0.36
Chrysene	<0.38	<0.38	<0.36
bis(2-Ethylhexyl)phthalate	<0.38	<0.38	<0.36
Benzo(b)fluoranthene	<0.38	<0.38	<0.36
Benzo(k)fluoranthene	<0.38	<0.38	<0.36
Benzo(a)pyrene	<0.38	<0.38	<0.36
Indeno(1,2,3-cd)pyrene	<0.38	<0.38	<0.36
Benzo(g,h,i)perylene	<0.38	<0.38	<0.36

mg/kg	Milligrams per kilogram.
ft	Feet.
--	Not available.
J	Estimated value.
Dup	Duplicate.
MS/MSD	This sample was designated as the matrix spike/matrix spike duplicate sample. This sample was also analyzed without the addition of the matrix spike/matrix spike duplicate compounds.

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Table 3-6. Detected Compounds in Soil/Residuals - Pesticides, July/August 1993, 12th Street Landfill Operable Unit, Plainwell, Michigan.

Sample Location:	SB-1	SB-1	SB-1 (Dup)	SB-2	SB-2	SB-4
Sample Depth:	26-28 ft	26-28 ft	26-28 ft	22-24 ft	22-24 ft	26-28 ft
Sample ID:	T90097	T90098	T90099	T90068	T90069	T90072
Sample Date:	08/13/93	08/13/93	08/13/93	08/05/93	08/05/93	08/10/93
Matrix:	Residuals	Soil	Soil	Residuals	Soil	Residuals
Units:	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
Parameters						
beta-BHC	<0.035 J	<0.0018	<0.0018	<0.031	0.026 JZ	<0.018 J
gamma-BHC	<0.035 J	<0.0018	<0.0018	<0.031	<0.021	<0.018 J
Heptachlor	<0.035 J	<0.0018	R	<0.031	<0.021	<0.018 J
Aldrin	<0.035 J	<0.0018	<0.0018	<0.031	0.11	0.16 JZ
Endosulfan I	<0.035 J	<0.0018	<0.0018	<0.031	<0.021	<0.018 J
4,4'-DDE	0.18 JNZ	<0.0036	<0.0035	<0.060	0.056 JZ	0.091 JZ
Endrin	<0.067 J	<0.0036	<0.0035	<0.060	<0.040	<0.035 J
Endosulfan II	<0.067 J	<0.0036	<0.0035	<0.060	<0.040	<0.035 J
4,4'-DDD	<0.067 J	<0.0036	<0.0035	<0.060	<0.040	<0.035 J
4,4'-DDT	R	<0.0036	<0.0035	<0.060	<0.040	<0.035 J
Endrin aldehyde	<0.067 J	<0.0036	<0.0035	<0.060	0.024 JZ	<0.035 J
alpha-Chlordane	R	<0.0018	R	<0.031	<0.021	<0.018 J
gamma-Chlordane	R	<0.0018	<0.0018	<0.031	<0.021	<0.018 J

mg/kg Milligrams per kilogram.
D Compound concentration determined at a secondary dilution factor.
J Estimated value.
N Presumptive evidence of material present.
Z Compound coelutes with aroclor peaks on one or both columns.
R Unusable value.
ft Feet.
— Not available.
Dup Duplicate.

Table 3-6. Detected Compounds in Soil/Residuals - Pesticides, July/August 1993, 12th Street Landfill Operable Unit, Plainwell, Michigan.

Sample Location:	SB-4	SB-5	SB-5	SB-6	MS/MSD SB-6	SB-6
Sample Depth:	26-28 ft	20-22 ft	20-22 ft	20-22 ft	20-22 ft	24-26 ft
Sample ID:	T90073	T90089	T90090	T90085	T90086	T90087
Sample Date:	08/10/93	08/12/93	08/12/93	08/13/93	08/12/93	08/12/93
Matrix:	Soil	Soil (fill)	Soil	Residuals	Residuals	Soil
Units:	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
Parameters						
beta-BHC	<0.0038	<0.0019	<0.0019	<0.032	<0.036 J	<0.0018 J
gamma-BHC	<0.0038	<0.0019	<0.0019	<0.032 J	<0.036 J	<0.0018 J
Heptachlor	<0.0038	<0.0019	<0.0019	<0.032	<0.036 J	<0.0018 J
Aldrin	<0.0038	<0.0019	<0.0019	<0.032	<0.036 J	<0.0018 J
Endosulfan I	<0.0038	<0.0019	<0.0019	<0.032	<0.036 J	<0.0018 J
4,4'-DDE	<0.0074	<0.0037	<0.0036	0.051 J	<0.070 J	<0.0035 J
Endrin	<0.0074	<0.0037	<0.0036	<0.062	<0.070 J	<0.0035 J
Endosulfan II	<0.0074	<0.0037	<0.0036	<0.062	<0.070 J	<0.0035 J
4,4'-DDD	<0.0074	<0.0037	<0.0036	<0.062	<0.070 J	<0.0035 J
4,4'-DDT	<0.0074	<0.0037	<0.0036	0.063	0.067 JZ	<0.0035 J
Endrin aldehyde	<0.0074	<0.0037	<0.0036	<0.062	<0.070 J	<0.0035 J
alpha-Chlordane	<0.0038	<0.0019	<0.0019	0.066	R	<0.0018 J
gamma-Chlordane	<0.0038	<0.0019	<0.0019	<0.032	R	<0.0018 J

mg/kg Milligrams per kilogram.
D Compound concentration determined at a secondary dilution factor.
J Estimated value.
N Presumptive evidence of material present.
Z Compound coelutes with aroclor peaks on one or both columns.
R Unusable value.
ft Feet.
-- Not available.
Dup Duplicate.

Table 3-6. Detected Compounds in Soil/Residuals - Pesticides, July/August 1993, 12th Street Landfill Operable Unit, Plainwell, Michigan.

Sample Location:	MS/MSD SB-6	SB-7	SB-7 (Dup)	SB-7	DB-1	DB-2
Sample Depth:	24-26 ft	24-26 ft	24-26 ft	24-26 ft	1-2 ft	0-1 ft
Sample ID:	T90088	T90078	T90079	T90080	T90000	T90002
Sample Date:	08/12/93	08/12/93	08/12/93	08/12/93	07/20/93	07/20/93
Matrix:	Soil	Residuals	Residuals	Soil	Soil	Soil
Units:	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
Parameters						
beta-BHC	<0.0018 J	<0.092 J	<0.040 J	<0.044	R	<0.0021
gamma-BHC	<0.0018 J	<0.092 J	<0.040 J	<0.044	<0.0039 J	<0.0021
Heptachlor	<0.0018 J	<0.092 J	<0.040 J	<0.044	<0.0039 J	<0.0021
Aldrin	<0.0018 J	<0.092 J	<0.040 J	<0.044	0.016 J	<0.0021
Endosulfan I	<0.0018 J	<0.092 J	<0.040 J	<0.044	0.0037 J	<0.0021
4,4'-DDE	<0.0035 J	<0.18 J	R	<0.085	0.0092 J	<0.004
Endrin	<0.0035 J	<0.18 J	<0.078 J	<0.085	<0.0077 J	<0.004
Endosulfan II	<0.0035 J	<0.18 J	<0.078 J	<0.085	<0.0077 J	<0.004
4,4'-DDD	<0.0035 J	0.15 JZ	0.061 J	<0.085	<0.0077 J	<0.004
4,4'-DDT	<0.0035 J	0.60 Z	0.14 J	<0.085	<0.0077 J	<0.004
Endrin aldehyde	<0.0035 J	<0.18 J	<0.078 J	<0.085	<0.0077 J	<0.004
alpha-Chlordane	R	R	R	R	0.0032 JN	<0.0021
gamma-Chlordane	<0.0018 J	R	R	<0.044	<0.0039 J	<0.0021

mg/kg Milligrams per kilogram.
D Compound concentration determined at a secondary dilution factor.
J Estimated value.
N Presumptive evidence of material present.
Z Compound coelutes with aroclor peaks on one or both columns.
R Unusable value.
ft Feet.
— Not available.
Dup Duplicate.

Table 3-6. Detected Compounds in Soil/Residuals - Pesticides, July/August 1993, 12th Street Landfill Operable Unit, Plainwell, Michigan.

Sample Location:	DB-3	DB-4	DB-5	DB-6	DB-7	DB-8
Sample Depth:	4-5 ft	1-2 ft	--	0-1 ft	--	0-1 ft
Sample ID:	T90004	T90005	T90008	T90006	T90013	T90010
Sample Date:	07/21/93	07/21/93	07/21/93	07/21/93	07/21/93	07/21/93
Matrix:	Soil	Soil	Soil	Soil	Soil	Soil
Units:	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
Parameters						
beta-BHC	<0.021 J	<0.014 J	<0.0051 J	<0.003	<0.0025	<0.0028
gamma-BHC	<0.021 J	<0.014 J	<0.0051 J	<0.003	<0.0025	<0.0028
Heptachlor	<0.021 J	<0.014 J	R	<0.003	<0.0025	<0.0028
Aldrin	<0.021 J	<0.014 J	<0.0051 J	<0.003	<0.0025	<0.0028
Endosulfan I	<0.021 J	<0.014 J	<0.0051 J	<0.003	<0.0025	<0.0028
4,4'-DDE	<0.041 J	<0.027 J	0.004 J	<0.0058	<0.0048	<0.0055
Endrin	<0.041 J	<0.027 J	<0.010 J	<0.0058	<0.0048	<0.0055
Endosulfan II	<0.041 J	<0.027 J	<0.010 J	<0.0058	<0.0048	<0.0055
4,4'-DDD	<0.041 J	<0.027 J	<0.010 J	<0.0058	<0.0048	<0.0055
4,4'-DDT	0.023 JN	<0.027 J	<0.010 J	<0.0058	0.0032 J	<0.0055
Endrin aldehyde	<0.041 J	<0.027 J	<0.010 J	<0.0058	<0.0048	<0.0055
alpha-Chlordane	R	<0.014 J	0.0041 J	<0.003	R	<0.0028
gamma-Chlordane	<0.021 J	<0.014 J	<0.0051 J	<0.003	<0.0025	<0.0028

mg/kg Milligrams per kilogram.
D Compound concentration determined at a secondary dilution factor.
J Estimated value.
N Presumptive evidence of material present.
Z Compound coelutes with aroclor peaks on one or both columns.
R Unusable value.
ft Feet.
-- Not available.
Dup. Duplicate.

Table 3-6. Detected Compounds in Soil/Residuals - Pesticides, July/August 1993, 12th Street Landfill Operable Unit, Plainwell, Michigan.

Sample Location:	DB-8 (Dup)	DB-9	DB-10	DB-11	DB-12	DB-12 (Dup)
Sample Depth:	0-1 ft	—	0-1 ft	—	0-1 ft	0-1 ft
Sample ID:	T90012	T90016	T90014	T90021	T90018	T90019
Sample Date:	07/21/93	07/21/93	07/21/93	07/22/93	07/22/93	07/22/93
Matrix:	Soil	Soil	Soil	Soil	Soil	Soil
Units:	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
Parameters						
beta-BHC	<0.0024	<0.0023	<0.0037 J	<0.0022	<0.0021	<0.0021
gamma-BHC	<0.0024	<0.0023	<0.0037 J	<0.0022	<0.0021	<0.0021
Heptachlor	<0.0024	0.0018 J	<0.0037 J	<0.0022	<0.0021	<0.0021
Aldrin	<0.0024	<0.0023	<0.0037 J	<0.0022	<0.0021	<0.0021
Endosulfan I	<0.0024	<0.0023	<0.0037 J	<0.0022	<0.0021	<0.0021
4,4'-DDE	<0.0046	0.0046 J	0.011 J	<0.0042	<0.0041	<0.0041
Endrin	<0.0046	<0.0044	0.0058 J	<0.0042	<0.0041	<0.0041
Endosulfan II	<0.0046	<0.0044	<0.0073 J	<0.0042	<0.0041	<0.0041
4,4'-DDD	<0.0046	<0.0044	0.0056 J	<0.0042	<0.0041	<0.0041
4,4'-DDT	<0.0046	R	R	<0.0042	<0.0041	<0.0041
Endrin aldehyde	<0.0046	<0.0044	<0.0073 J	<0.0042	<0.0041	<0.0041
alpha-Chlordane	<0.0024	R	0.012 J	<0.0022	<0.0021	<0.0021
gamma-Chlordane	<0.0024	<0.0023	0.0031 J	<0.0022	<0.0021	<0.0021

mg/kg Milligrams per kilogram.
D Compound concentration determined at a secondary dilution factor.
J Estimated value.
N Presumptive evidence of material present.
Z Compound coelutes with aroclor peaks on one or both columns.
R Unusable value.
ft Feet.
— Not available.
Dup Duplicate.

Table 3-6. Detected Compounds in Soil/Residuals - Pesticides, July/August 1993, 12th Street Landfill Operable Unit, Plainwell, Michigan.

Sample Location:	DB-13	DB-14	MW-1	MW-1	MW-2B	MW-2B
Sample Depth:	--	0-1 ft	6-8 ft	6-8 ft	3-5 ft	5-6 ft
Sample ID:	T90024	T90025	T90105	T90106	T90029	T90030
Sample Date:	07/22/93	07/22/93	08/17/93	08/17/93	07/30/93	07/30/93
Matrix:	Soil	Soil	Residuals	Soil	Residuals	Soil
Units:	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
Parameters						
beta-BHC	<0.009	<0.0025	<0.024	<0.0067	R	<0.0085 J
gamma-BHC	<0.009	<0.0025	<0.024 J	0.0089 J	<0.030 J	<0.0085 J
Heptachlor	<0.009	<0.0025	<0.024	<0.0067	<0.030 J	<0.0085 J
Aldrin	<0.009	<0.0025	<0.024	<0.0067	0.42 J	0.0093 J
Endosulfan I	<0.009	<0.0025	<0.024	<0.0067	<0.030 J	<0.0085 J
4,4'-DDE	0.025 JN	<0.0049	<0.047	<0.013	0.18 J	<0.016 J
Endrin	<0.017	0.0029 J	<0.047	<0.013	<0.57 J	<0.016 J
Endosulfan II	<0.017	<0.0049	<0.047	<0.013	<0.57 J	<0.016 J
4,4'-DDD	<0.017	<0.0049	0.031 J	<0.013	<0.57 J	<0.016 J
4,4'-DDT	R	0.0071 J	0.16 J	<0.013	<0.57 J	<0.016 J
Endrin aldehyde	<0.017	<0.0049	<0.047	<0.013	R	<0.016 J
alpha-Chlordane	0.027 JN	<0.0025	0.13 J	<0.0067	<0.030 J	<0.0085 J
gamma-Chlordane	R	<0.0025	R	<0.0067	<0.030 J	<0.0085 J

mg/kg Milligrams per kilogram.
D Compound concentration determined at a secondary dilution factor.
J Estimated value.
N Presumptive evidence of material present.
Z Compound coelutes with aroclor peaks on one or both columns.
R Unusable value.
ft Feet.
-- Not available.
Dup Duplicate.

Table 3-6. Detected Compounds in Soil/Residuals - Pesticides, July/August 1993, 12th Street Landfill Operable Unit, Plainwell, Michigan.

Sample Location:	MW-3B	MW-3B	MW-4B	MW-4B	MW-5B	MW-5B
Sample Depth:	2-4 ft	2-4 ft	2-4 ft	2-4 ft	0-2 ft	0-2 ft
Sample ID:	T90032	T90033	T90027	T90028	T90036	T90039
Sample Date:	07/30/93	07/30/93	08/03/93	08/03/93	07/30/93	07/30/93
Matrix:	Soil	Residuals	Soil	Residuals	Soil	Residuals
Units:	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
Parameters						
beta-BHC	<0.002	R	<0.027	<0.0052	R	R
gamma-BHC	<0.002	<0.024 J	<0.027	<0.0052	<0.0021	<0.029 J
Heptachlor	<0.002	<0.024 J	<0.027	<0.0052	<0.0021	<0.029 J
Aldrin	0.0013 J	0.13 JZ	<0.027	0.013	0.012	0.51 JZ
Endosulfan I	<0.002	<0.024 J	<0.027	<0.0052	<0.0021	<0.029 J
4,4'-DDE	<0.0039	0.042 JZ	0.68	R	0.0047	0.23 JZ
Endrin	<0.0039	<0.046 J	<0.053	<0.010	0.006 J	<0.056 J
Endosulfan II	<0.0039	<0.046 J	<0.053	R	<0.004	0.036 JZ
4,4'-DDD	<0.0039	<0.046 J	0.13	<0.010	<0.004	<0.056 J
4,4'-DDT	<0.0039	<0.046 J	0.46 J	<0.010	<0.004	<0.056 J
Endrin aldehyde	<0.0039	<0.046 J	<0.053	<0.010	<0.004	R
alpha-Chlordane	<0.002	<0.024 J	R	0.020 J	<0.0021	<0.029 J
gamma-Chlordane	<0.002	<0.024 J	R	0.022	<0.0021	<0.029 J

mg/kg Milligrams per kilogram.
D Compound concentration determined at a secondary dilution factor.
J Estimated value.
N Presumptive evidence of material present.
Z Compound coelutes with aroclor peaks on one or both columns.
R Unusable value.
ft Feet.
— Not available.
Dup Duplicate.

Table 3-6. Detected Compounds in Soil/Residuals - Pesticides, July/August 1993, 12th Street Landfill Operable Unit, Plainwell, Michigan.

Sample Location:	MW-6B	MW-7B	MW-8B
Sample Depth:	6-8 ft	8-10 ft	30-32
Sample ID:	T90043	T90046	T90103
Sample Date:	08/03/93	08/05/93	08/17/93
Matrix:	Soil	Soil	Soil
Units:	mg/kg	mg/kg	mg/kg
Parameters			
beta-BHC	<0.0019	<0.0019	<0.0018
gamma-BHC	<0.0019	<0.0019	<0.0018
Heptachlor	<0.0019	<0.0019	<0.0018
Aldrin	<0.0019	<0.0019	<0.0018
Endosulfan I	<0.0037	<0.0019	<0.0018
4,4'-DDE	<0.0037	<0.0038	<0.0036
Endrin	<0.0037	<0.0038	<0.0036
Endosulfan II	<0.0037	<0.0038	<0.0036
4,4'-DDD	<0.0037	<0.0038	<0.0036
4,4'-DDT	<0.0037	<0.0038	<0.0036
Endrin aldehyde	<0.0037	<0.0038	<0.0036
alpha-Chlordane	<0.0019	<0.0019	<0.0036
gamma-Chlordane	<0.0019	<0.0019	<0.0018

mg/kg Milligrams per kilogram.
D Compound concentration determined at a secondary dilution factor.
J Estimated value.
N Presumptive evidence of material present.
Z Compound coelutes with aroclor peaks on one or both columns.
R Unusable value.
ft Feet.
-- Not available.
Dup Duplicate.

Table 3-7. Detected Compounds in Soil/Residuals - Inorganic Constituents, July/August 1993, 12th Street Landfill Operable Unit, Plainwell, Michigan.

Sample Location:	SB-1	SB-1	SB-1 (Dup)	SB-2	SB-2	SB-4
Sample Depth:	26-28 ft	26-28 ft	26-28 ft	22-24 ft	22-24 ft	26-28 ft
Sample ID:	T90097	T90098	T90099	T90068	T90069	T90072
Sample Date:	08/13/93	08/13/93	08/13/93	08/05/93	08/05/93	08/10/93
Matrix:	Residuals	Soil	Soil	Residuals	Soil	Residuals
Units:	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
Analyte						
Aluminum	11100	2930	1780	7430	6120	8450 J
Antimony	<14.5	<6.2 J	23.5 J	<12.8 J	<7.8 J	<14.1 J
Arsenic	1.5 B	5.3	4.6	0.57 B	1.1 B	0.61 BJ
Barium	100 J	24.1 B	16.3 B	26.4 B	292	476 J
Beryllium	<0.26	0.12 B	<0.17	<0.23	0.15 B	<0.25 J
Cadmium	<0.81 J	<0.44	<0.52	<0.72	<0.44	<0.79 J
Calcium	10300	118000 J	129000 J	3880	38000	43000 J
Chromium	42.3	9.2 J	5.5 J	12.0	71.6	173 J
Cobalt	6.6 B	3.6 B	2.6 B	<1.4	5.2 B	9.2 BJ
Copper	279 J	12.8	7.3	80.7	47.3	108 J
Iron	2210	9180	8410	1150	4510	1320 J
Lead	187 J	6.9 J	6.2 J	9.7	371	946 J
Magnesium	1140 B	49100 J	34300 J	688 B	1280	1510 J
Manganese	34.1 J	710 J	609 J	20.4	116	71.5 J
Mercury	1.4	<0.04	<0.05	<0.07	0.74	5.2 J
Nickel	3.8 B	7.9	7.7	2.1 B	5.4 B	2.7 BJ
Potassium	247 B	302 B	<139	<191	<117	<211 J
Selenium	<0.45	<0.19	1.5	<0.33	<0.19 J	<0.25 J
Silver	<1.6	<0.68	<1.0	1.6 B	<0.86	<1.6 J
Sodium	<273	210 B	175 B	<242	<148	519 BJ
Vanadium	18.0	10.8	7.5 B	11.7 B	9.3	12.1 BJ
Zinc	697 J	48.0	27.3	421	170	312 J
Cyanide	7.9 J	0.33 B	<0.08	1.3	0.56 B	4.7 J

mg/kg Milligrams per kilogram.

B Compound concentration between instrument detection limit and contract required quantitation limit.

J Estimated value.

Dup Duplicate.

MS/MSD This sample was designated as the matrix spike/matrix spike duplicate sample. This sample was also analyzed without the addition of the matrix spike/matrix spike duplicate compounds.

Table 3-7. Detected Compounds in Soil/Residuals - Inorganic Constituents, July/August 1993, 12th Street Landfill Operable Unit, Plainwell, Michigan.

Sample Location:	SB-4	SB-5	SB-5	SB-6	MS/MSD SB-6	SB-6
Sample Depth:	26-28 ft	20-22 ft	20-22 ft	20-22 ft	20-22 ft	24-26 ft
Sample ID:	T90073	T90089	T90090	T90085	T90086	T90087
Sample Date:	08/10/93	08/12/93	08/12/93	08/12/93	08/12/93	08/12/93
Matrix:	Soil	Soil (fill)	Soil	Residuals	Residuals	Soil
Units:	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
Analyte						
Aluminum	6500 J	4440	3440	12900	12700 J	3450
Antimony	<16.0 J	<6.1 J	<5.9 J	<10.0	<10.8 J	8.4 BJ
Arsenic	8.1 J	6.1	23.8	0.71 B	3.1 BJ	3.1
Barium	85.4 J	25.7	17.6 B	155 J	255 J	25.8 B
Beryllium	0.38 BJ	0.18 B	0.19 B	0.31 B	0.29 BJ	0.15 B
Cadmium	<0.90 J	<0.34	<0.33	<0.56 J	<0.61 J	<0.40
Calcium	15000 J	2450 J	52100 J	7740	10000 J	37700 J
Chromium	13.2 J	5.8 J	8.4 J	46.1	30.6 J	7.4 J
Cobalt	<1.8 J	6.7	4.4 B	5.6 B	3.1 BJ	3.8 B
Copper	13.2 J	23.6	12.2	110 J	156 J	10.7
Iron	7480 J	12000	12400	3110	4950 J	7290
Lead	20.0 J	5.0 J	4.1 J	226 J	140 J	4.1 J
Magnesium	7590 J	1860 J	17000 J	1140	3420 J	13900 J
Manganese	22.0 J	149 J	296 J	70.2 J	462 J	408 J
Mercury	<0.09 J	<0.04	<0.04	0.63	0.74 J	<0.05
Nickel	8.3 BJ	10.6	9.3	3.0 B	5.3 BJ	13.5
Potassium	<239 J	908	452 B	174 B	297 BJ	384 B
Selenium	5.0 J	<0.22 J	0.68 BJ	<0.46	<0.50 J	0.64 BJ
Silver	<1.8 J	<0.67	<0.65	<1.1	<1.2 J	<0.78
Sodium	713 BJ	<115	117 B	<190	<205 J	158 B
Vanadium	20.5 J	21.7	13.9	20.9	20.8 J	8.8
Zinc	23.5 J	22.7	17.0	422 J	381 J	21.5
Cyanide	2.1 J	<0.08	<0.08	8.1 J	5.9 J	<0.08

mg/kg Milligrams per kilogram.
B Compound concentration between instrument detection limit and contract required quantitation limit.
J Estimated value.
Dup Duplicate.
MS/MSD This sample was designated as the matrix spike/matrix spike duplicate sample. This sample was also analyzed without the addition of the matrix spike/matrix spike duplicate compounds.

Table 3-7. Detected Compounds in Soil/Residuals - Inorganic Constituents, July/August 1993, 12th Street Landfill Operable Unit, Plainwell, Michigan.

Sample Location:	MS/MSD SB-6		SB-7		SB-7 (Dup)		SB-7		DB-1		DB-2	
Sample Depth:	24-26 ft		24-26 ft		24-26 ft		24-26 ft		1-2 ft		0-1 ft	
Sample ID:	T90088		T90078		T90079		T90080		T90000		T90002	
Sample Date:	08/12/93		08/12/93		08/12/93		08/12/93		07/20/93		07/20/93	
Matrix:	Soil		Residuals		Residuals		Soil		Soil		Soil	
Units:	mg/kg		mg/kg		mg/kg		mg/kg		mg/kg		mg/kg	
Analyte												
Aluminum	3680		8780	J	10200	J	7480	J	2800		20500	
Antimony	<7.0	J	<23.9	J	<12.7	J	<21.8	J	<6.4	J	<10.2	J
Arsenic	4.1		0.90	BJ	1.0	BJ	12.7	J	3.1		5.1	
Barium	25.3	B	357	J	433	J	246	J	47.6		102	
Beryllium	0.19	B	<0.43	J	<0.23	J	<0.39	J	0.18	B	0.80	B
Cadmium	<0.39		<1.3	J	4.2	J	<1.6	J	<0.36		<0.57	
Calcium	181000	J	34300	J	48500	J	80700	J	149000		5830	
Chromium	7.9	J	88.1	J	115	J	115	J	7.4		31.9	
Cobalt	3.1	B	7.3	BJ	11.2	BJ	14.9	BJ	2.4	B	10.5	
Copper	8.8		68.8	J	87.3	J	98.4	J	9.3		21.2	
Iron	7960		2240	J	3190	J	11600	J	7410		27500	
Lead	6.6	J	499	J	636	J	457	J	47.8		25.2	J
Magnesium	27700	J	1480	BJ	2230	J	5300	J	86900		6790	
Manganese	511	J	80.1	J	169	J	255	J	867		327	
Mercury	<0.03		3.0	J	2.0	J	2.2	J	0.12		<0.05	
Nickel	9.1		3.7	BJ	5.4	BJ	22.0	J	4.5	B	28.4	
Potassium	457	B	<358	J	<191	J	<327	J	294	B	2050	
Selenium	<0.22	J	<0.63	J	0.53	BJ	1.9	BJ	<0.18		0.35	BJ
Silver	<0.77		<2.6	J	2.0	BJ	<2.4	J	<0.70		<1.1	
Sodium	172	B	<452	J	405	BJ	623	BJ	176	B	<193	
Vanadium	10.5		11.6	BJ	14.5	J	16.9	BJ	6.6		41.4	
Zinc	24.4		235	J	378	J	275	J	41.4		58.0	
Cyanide	<0.08		1.9	J	2.6	J	0.81	BJ	<0.08		<0.09	

mg/kg Milligrams per kilogram.
B Compound concentration between instrument detection limit and contract required quantitation limit.
J Estimated value.
Dup Duplicate.
MS/MSD This sample was designated as the matrix spike/matrix spike duplicate sample. This sample was also analyzed without the addition of the matrix spike/matrix spike duplicate compounds.

Table 3-7. Detected Compounds in Soil/Residuals - Inorganic Constituents, July/August 1993, 12th Street Landfill Operable Unit, Plainwell, Michigan.

Sample Location:	DB-3	DB-4	DB-5	DB-6	DB-7	DB-8
Sample Depth:	4-5 ft	1-2 ft	--	0-1 ft	--	0-1 ft
Sample ID:	T90004	T90005	T90008	T90006	T90013	T90010
Sample Date:	07/21/93	07/21/93	07/21/93	07/21/93	07/21/93	07/21/93
Matrix:	Soil	Soil	Soil	Soil	Soil	Soil
Units:	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
Analyte						
Aluminum	4460 J	5330 J	10800 J	18000	6490	9310
Antimony	<44.6 J	<52.4 J	<24.9 J	<14.4 J	<12.4 J	17.4 J
Arsenic	4.3 BJ	25.4 J	15.8 J	16.7	10.1	15.5
Barium	187 J	81.9 BJ	118 J	137	188	179
Beryllium	<0.80 J	<0.94 J	0.56 BJ	0.86 B	<0.38	<0.54
Cadmium	<2.5 J	<2.9 J	<1.4 J	<0.81	<0.69	<0.61
Calcium	40400 J	24200 J	11000 J	6340	6400	5460
Chromium	29.2 J	13.6 J	25.0 J	25.4	25.1	21.9
Cobalt	<4.9 J	<5.8 J	5.1 BJ	4.8 B	5.1 B	8.5 B
Copper	34.9 J	42.3 J	27.1 J	3.0 B	27.3	17.6
Iron	9740 J	21800 J	18100 J	30100	15000	25100
Lead	46.5 J	82.8 J	48.9 J	13.9 J	32.2 J	29.4 J
Magnesium	3640 BJ	5930 J	2870 J	3080	1540	1870
Manganese	119 J	200 J	126 J	111	555	1940
Mercury	<0.27 J	0.59 BJ	0.86 J	<0.08	0.26	0.15
Nickel	<6.7 J	10.1 BJ	9.2 BJ	9.8 B	9.7 B	13.9
Potassium	<667 J	<784 J	926 BJ	687 B	203 B	582 B
Selenium	4.8 BJ	4.8 J	2.6 J	1.4	0.69 B	0.80 B
Silver	<4.9 J	<5.8 J	<2.7 J	<1.6	<1.4	<1.2
Sodium	<842 J	<991 J	<471 J	<272	<234	<207
Vanadium	31.2 BJ	29.2 BJ	28.1 J	49.4	17.3	25.7
Zinc	91.7 J	102 J	84.3 J	57.8	70.3	47.9
Cyanide	<0.48 J	<0.61 J	<0.22 J	<0.12	<0.10	<0.12

mg/kg	Milligrams per kilogram.
B	Compound concentration between instrument detection limit and contract required quantitation limit.
J	Estimated value.
Dup	Duplicate.
MS/MSD	This sample was designated as the matrix spike/matrix spike duplicate sample. This sample was also analyzed without the addition of the matrix spike/matrix spike duplicate compounds.

Table 3-7. Detected Compounds in Soil/Residuals - Inorganic Constituents, July/August 1993, 12th Street Landfill Operable Unit, Plainwell, Michigan.

Sample Location:	DB-8 (Dup)	DB-9	DB-10	DB-11	DB-12	DB-12 (Dup)
Sample Depth:	0-1 ft	—	0-1 ft	—	0-1 ft	0-1 ft
Sample ID:	T90012	T90016	T90014	T90021	T90018	T90019
Sample Date:	07/21/93	07/21/93	07/21/93	07/22/93	07/22/93	07/22/93
Matrix:	Soil	Soil	Soil	Soil	Soil	Soil
Units:	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
Analyte						
Aluminum	6620	4670	5690 J	6620	3180	3920
Antimony	<8.5 J	<12.9 J	<21.9 J	12.5 J	<6.3 J	<9.7 J
Arsenic	15.6	12.1	25.4 J	17.7	6.9	7.5
Barium	146	88.6	147 J	119	35.2	58.1
Beryllium	<0.39	<0.30	<0.39 J	<0.41	<0.12	<0.22
Cadmium	<0.48	<0.72	1.5 BJ	<0.46	<0.35	<0.55
Calcium	5100	12100	24300 J	4250	13200	17200
Chromium	17.2	13.6	48.8 J	13.3	8.4	11.6
Cobalt	5.2 B	3.8 B	3.1 BJ	6.2 B	2.8 B	2.8 B
Copper	12.8	16.3	51.7 J	9.8	5.3	9.0
Iron	20600	14400	18300 J	27400	9380	11000
Lead	38.0 J	75.0 J	116 J	11.0 J	8.2 J	6.8 J
Magnesium	1360	1610	3790 J	1700	6790	7900
Manganese	2010	893	674 J	2980	416	655
Mercury	0.14	1.1	0.62 J	0.08 B	<0.05	<0.05
Nickel	9.1	6.3 B	13.7 BJ	12.5	6.6	9.5
Potassium	317 B	385 B	428 BJ	509 B	288 B	404 B
Selenium	0.66 BJ	0.50 B	0.85 BJ	0.60 B	<0.36	<0.26
Silver	<0.94	<1.4	<2.4 J	<0.91	<0.69	<1.1
Sodium	<161	<243	<414 J	<156	<119	<184
Vanadium	19.0	14.0	15.4 BJ	21.4	9.7	12.1
Zinc	37.8	47.2	134 J	50.7	20.0	26.8
Cyanide	<0.10	<0.09	<0.15 J	<0.09	<0.09	<0.09

mg/kg Milligrams per kilogram.
B Compound concentration between instrument detection limit and contract required quantitation limit.
J Estimated value.
Dup Duplicate.
MS/MSD This sample was designated as the matrix spike/matrix spike duplicate sample. This sample was also analyzed without the addition of the matrix spike/matrix spike duplicate compounds.

Table 3-7. Detected Compounds in Soil/Residuals - Inorganic Constituents, July/August 1993, 12th Street Landfill Operable Unit, Plainwell, Michigan.

Sample Location:	DB-13	DB-14	MW-1	MW-1	MW-2B	MW-2B
Sample Depth:	--	0-1 ft	6-8 ft	6-8 ft	3-5 ft	5-6 ft
Sample ID:	T90024	T90025	T90105	T90106	T90029	T90030
Sample Date:	07/22/93	07/22/93	08/17/93	08/17/93	07/30/93	07/29/93
Matrix:	Soil	Soil	Residuals	Soil	Residuals	Soil
Units:	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
Analyte						
Aluminum	7550	4480	5800 J	3910 J	8930	11900 J
Antimony	<7.1 J	<12.2 J	<13.6 J	<33.9 J	<15.9 J	<34.6 J
Arsenic	3.4	16.0	1.4 BJ	6.2 BJ	6.4	<6.1 J
Barium	41.8	133	379 J	106 BJ	186	122 BJ
Beryllium	0.21 B	0.27 B	<0.24 J	<0.61 J	0.73 B	0.75 BJ
Cadmium	<0.40	<0.68	<0.76 J	<1.9 J	<0.89	<1.9 J
Calcium	2500	17300	33600 J	37700 J	27500	6710 J
Chromium	15.5	16.2	141 J	7.5 J	18.3	39.2 J
Cobalt	3.8 B	2.3 B	5.8 BJ	<3.7 J	5.5 B	11.1 BJ
Copper	12.9	13.8	45.4 J	10.2 BJ	86.1	7.5 BJ
Iron	9720	20200	3690 J	8490 J	4920	27500 J
Lead	33.1 J	48.2 J	823 J	10.7 J	335	16.9 J
Magnesium	1860	3410	1210 BJ	5910 J	1610	4490 J
Manganese	240	879	82.7 J	16.5 J	98.7	219 J
Mercury	0.10	0.11 B	2.9 J	0.38 BJ	0.36	<0.19 J
Nickel	8.6	11.0	2.9 BJ	14.5 BJ	8.1 B	18.7 BJ
Potassium	313 B	234 B	<203 J	<507 J	<239	1260 BJ
Selenium	<0.25	0.31 B	0.35 BJ	7.8 J	3.1	<1.3 J
Silver	<0.78	<1.3	<1.5 J	<3.7 J	<1.8	<3.8 J
Sodium	<134	<231	<257 J	682 BJ	<301	<654 J
Vanadium	14.6	13.4	10.1 BJ	47.9 J	18.2	35.5 J
Zinc	70.8	91.7	224 J	9.0 BJ	383	50.1 J
Cyanide	<0.70	<0.11	1.3 J	0.61 BJ	0.67 B	<0.36 J

mg/kg Milligrams per kilogram.
B Compound concentration between instrument detection limit and contract required quantitation limit.
J Estimated value.
Dup Duplicate.
MS/MSD This sample was designated as the matrix spike/matrix spike duplicate sample. This sample was also analyzed without the addition of the matrix spike/matrix spike duplicate compounds.

Table 3-7. Detected Compounds in Soil/Residuals - Inorganic Constituents, July/August 1993, 12th Street Landfill Operable Unit, Plainwell, Michigan

Sample Location:	MW-3B	MW-3B	MW-4B	MW-4B	MW-5B	MW-5B
Sample Depth:	2-4 ft	2-4 ft	2-4 ft	2-4 ft	0-2 ft	0-2 ft
Sample ID:	T90032	T90033	T90027	T90028	T90036	T90039
Sample Date:	07/29/93	07/30/93	08/03/93	08/03/93	07/29/93	07/30/93
Matrix:	Soil	Residuals	Soil	Residuals	Soil	Residuals
Units:	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
Analyte						
Aluminum	6830	7140	14700	10400	3490	9780
Antimony	<7.0 J	<12.0 J	<10.7 J	<14.8 J	<8.1 J	<15.1 J
Arsenic	15.1	2.3	2.0 BJ	7.6	9.5	0.80 B
Barium	122	796	364	164	57.7	613
Beryllium	0.39 B	<0.22	0.34 B	2.4	0.18 B	<0.27
Cadmium	<0.39	<0.67	<0.73	<0.83	<0.45	<0.85
Calcium	3710	21600	23900 J	3310	5050	28300
Chromium	11.9	56.3	71.2 J	21.2	7.7	156
Cobalt	6.8 B	5.5 B	5.8 B	3.9 B	2.5 B	8.2 B
Copper	3.4 B	56.2	84.3	89.6	5.2	68.5
Iron	28100	3090	5700	3730	14000	4110
Lead	7.2 J	308	444 J	32.6	4.4 J	840
Magnesium	1230	805 B	707 BJ	609 B	1480	733 B
Manganese	1040	167	264 J	45.6	202	118
Mercury	0.06 B	1.4	0.91	0.11 B	<0.05	5.0
Nickel	7.3	2.5 B	3.5 B	8.1 B	5.2 B	3.2 B
Potassium	228 B	<180	<160 J	<221	230 B	<226
Selenium	0.47 B	<0.22	0.71 B	0.48 BJ	0.52 B	<0.28
Silver	<0.77	<1.3	2.3	<1.6	<0.89	<1.7
Sodium	<132	<227	<202	<280	<153	<286
Vanadium	19.0	9.8 B	19.3	23.3	12.0	9.4 B
Zinc	25.0	286	319	398	11.7	346
Cyanide	<0.09	0.08 B	<0.24 J	<0.12	<0.09	0.40 B

mg/kg Milligrams per kilogram.
B Compound concentration between instrument detection limit and contract required quantitation limit.
J Estimated value.
Dup Duplicate.
MS/MSD This sample was designated as the matrix spike/matrix spike duplicate sample. This sample was also analyzed without the addition of the matrix spike/matrix spike duplicate compounds.

Table 3-7. Detected Compounds in Soil/Residuals - Inorganic Constituents, July/August 1993, 12th Street Landfill Operable Unit, Plainwell, Michigan

Sample Location:	MW-6B	MW-7B	MW-8B
Sample Depth:	6-8 ft	8-10 ft	30-32 ft
Sample ID:	T90043	T90046	T90103
Matrix:	Soil	Soil	Soil
Units:	mg/kg	mg/kg	mg/kg
Analyte			
Aluminum	1610	2650	1940
Antimony	<5.8 J	<6.5 J	<7.8 J
Arsenic	1.3 B	1.3 B	4.3
Barium	11.3 B	10.1 B	14.5 B
Beryllium	<0.10	0.27 B	0.14 B
Cadmium	<0.37	<0.45	<0.55
Calcium	497 BJ	14300 J	133000 J
Chromium	3.0 J	5.7 J	7.1 J
Cobalt	1.3 B	3.5 B	3.0 B
Copper	2.7 B	12.6	6.8
Iron	3450	13400	12900
Lead	1.6 J	1.2 J	4.9 J
Magnesium	540 BJ	5150 J	38800 J
Manganese	189 J	190 J	408 J
Mercury	<0.04	<0.04	<0.04
Nickel	4.0 B	8.5	6.9
Potassium	93.1 B	<96.5	234 B
Selenium	<0.25	<0.19	0.74 B
Silver	<0.63	<0.71	<0.86
Sodium	<109	128 B	192 B
Vanadium	4.7 B	12.8	8.5
Zinc	7.7	17.4	14.4
Cyanide	<0.08 J	<0.08	0.05 BJ

mg/kg	Milligrams per kilogram.
B	Compound concentration between instrument detection limit and contract required quantitation limit.
J	Estimated value.
Dup	Duplicate.
MS/MSD	This sample was designated as the matrix spike/matrix spike duplicate sample. This sample was also analyzed without the addition of the matrix spike/matrix spike duplicate compounds.

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Table 3-8. Detected Compounds in Soil/Residuals - PCBs, July/August 1993, 12th Street Landfill Operable Unit, Plainwell, Michigan.

Parameters	Sample Location:	DB-1*	DB-2*	DB-3	DB-3*	DB-4*	DB-5	DB-5*	DB-6*
	Sample Depth:	1-2 ft	0-1 ft	1-2 ft	4-5 ft	1-2 ft	--	--	0-1 ft
	Sample ID:	T90000	T90002	T90003	T90004	T90005	T90007	T90008	T90006
	Sample Date:	07/20/93	07/20/93	07/21/93	07/21/93	07/21/93	07/21/93	07/21/93	07/21/93
	Matrix:	Soil	Soil	Residuals	Soil	Soil	Residuals	Soil	Soil
	Units:	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
Aroclor-1016		<0.0077 J	<0.04	90 J	<0.041 J	<0.27 J	<5.9 J	<0.10 J	<0.0058
Aroclor-1221		<0.16 J	<0.082	<13 J	<0.83 J	<0.56 J	<5.9 J	<0.20 J	<0.12
Aroclor-1232		<0.0077 J	<0.04	<13 J	<0.041 J	<0.27 J	<5.9 J	<0.10 J	<0.0058
Aroclor-1242		<0.0077 J	<0.04	<13 J	<0.041 J	<0.27 J	32 J	<0.10 J	<0.0058
Aroclor-1248		0.73 J	<0.04	68 J	4.7 J	<0.27 J	38 J	0.36 J	0.086
Aroclor-1254		<0.0077 J	<0.04	<13 J	<0.041 J	<0.27 J	<5.9 J	<0.10 J	<0.0058
Aroclor-1260		0.13 J	<0.04	<13 J	<0.041 J	<0.27 J	<5.9 J	<0.10 J	<0.0058
Total PCBs		0.86	0	158	4.7	0	70	0.36	0.086

mg/kg	Milligrams per kilogram.
PCBs	Polychlorinated biphenyls.
ft	Feet.
--	Not available.
D	Compound concentration determined at a secondary dilution factor.
E	Compound concentration exceeded the calibration range of the instrument.
J	Estimated value.
C	Result confirmed by gas chromatography/mass spectrometry.
R	Unusable value.
Dup.	Duplicate.
*	Sample analyzed by U.S. Environmental Protection Agency (USEPA) SW-846 method 8081.

Table 3-8. Detected Compounds in Soil/Residuals - PCBs, July/August 1993, 12th Street Landfill Operable Unit, Plainwell, Michigan.

Parameters	Sample Location:	DB-11	DB-11*	DB-12*	DB-12 (Dup)*	DB-13	DB-13*	DB-14*	SB-1
	Sample Depth:	--	--	0-1 ft	0-1 ft	--	--	0-1 ft	22-24 ft
	Sample ID:	T90020	T90021	T90018	T90019	T90023	T90024	T90025	T90100
	Sample Date:	07/22/93	07/22/93	07/22/93	07/22/93	07/22/93	07/22/93	07/22/93	08/13/93
	Matrix:	Residuals	Soil	Soil	Soil	Residuals	Soil	Soil	Residuals
	Units:	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
Aroclor-1016		<0.50	<0.042	<0.041	<0.041	<3.1	<0.17	<0.049	<0.11 J
Aroclor-1221		<0.50	<0.085	<0.084	<0.083	<3.1	<0.36	<0.099	<0.11 J
Aroclor-1232		<0.50	<0.042	<0.041	<0.041	<3.1	<0.17	<0.049	<0.11 J
Aroclor-1242		<0.50	<0.042	<0.041	<0.041	<3.1	<0.17	<0.049	<0.11 J
Aroclor-1248		2.0	<0.042	<0.041	<0.041	24	1.5	0.040 J	<0.11 J
Aroclor-1254		1.7	<0.042	<0.041	<0.041	3.8 J	0.20 J	0.062	1.1 J
Aroclor-1260		<0.50	<0.042	<0.041	<0.041	<3.1	0.13 J	<0.049	<0.11 J
Total PCBs		3.7	0	0	0	27.8	1.83	0.102	1.1

mg/kg	Milligrams per kilogram.
PCB	Polychlorinated biphenyls.
ft	Feet.
--	Not available.
D	Compound concentration determined at a secondary dilution factor.
E	Compound concentration exceeded the calibration range of the instrument.
J	Estimated value.
C	Result confirmed by gas chromatography/mass spectrometry.
R	Unusable value.
Dup.	Duplicate.
*	Sample analyzed by U.S. Environmental Protection Agency (USEPA) SW-846 method 8081.

Table 3-8. Detected Compounds in Soil/Residuals - PCBs, July/August 1993, 12th Street Landfill Operable Unit, Plainwell, Michigan.

Sample Location:	DB-7 (Dup)	DB-7	DB-7*	DB-8*	DB-8 (Dup)*	DB-9	DB-9*	DB-10*
Sample Depth:	--	--	--	0-1 ft	0-1 ft	--	--	0-1 ft
Sample ID:	T90009	T90011	T90013	T90010	T90012	T90015	T90016	T90014
Sample Date:	07/21/93	07/21/93	07/21/93	07/21/93	07/21/93	07/21/93	07/21/93	07/21/93
Matrix:	Residuals	Residuals	Soil	Soil	Soil	Residuals	Soil	Soil
Units:	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
Parameters								
Aroclor-1016	<5.0 J	<4.7	<0.048	<0.055	<0.046	<5.1 J	<0.044	<0.073 J
Aroclor-1221	<5.0 J	<4.7	<0.097	<0.11	<0.093	<5.1 J	<0.089	<0.15 J
Aroclor 1232	<5.0 J	<4.7	<0.048	<0.055	<0.046	<5.1 J	<0.044	<0.073 J
Aroclor-1242	<5.0 J	<4.7	<0.048	<0.055	<0.046	<5.1 J	<0.044	<0.073 J
Aroclor-1248	37 J	43	0.25	0.036 J	0.023 J	49 J	0.31	0.63 J
Aroclor-1254	<5.0 J	<4.7	<0.048	<0.055	<0.046	10 J	0.022 J	0.12 J
Aroclor-1260	2.0 J	2.1 J	<0.048	<0.055	<0.046	<5.1 J	0.034 J	0.15 J
Total PCBs	39	45.1	0.25	0.036	0.023	59	0.366	0.9

mg/kg	Milligrams per kilogram.
PCB	Polychlorinated biphenyls.
ft	Feet.
--	Not available.
D	Compound concentration determined at a secondary dilution factor.
E	Compound concentration exceeded the calibration range of the instrument.
J	Estimated value.
C	Result confirmed by gas chromatography/mass spectrometry.
R	Unusable value.
Dup.	Duplicate.
*	Sample analyzed by U.S. Environmental Protection Agency (USEPA) SW-846 method 8081.

Table 3-8. Detected Compounds in Soil/Residuals - PCBs, July/August 1993, 12th Street Landfill Operable Unit, Plainwell, Michigan.

Parameters	Sample Location:	SB-1	SB-1*	SB-1*	SB-1 (Dup)*	SB-2	SB-2	SB-2	SB-2*
	Sample Depth:	24-26 ft	26-28 ft	26-28 ft	26-28 ft	8-10 ft	18-20 ft	20-22 ft	22-24 ft
	Sample ID:	T90101	T90097	T90098	T90099	T90061	T90066	T90067	T90068
	Sample Date:	08/13/93	08/13/93	08/13/93	08/13/93	08/05/93	08/05/93	08/05/93	08/05/93
	Matrix:	Residuals	Residuals	Soil	Soil	Residuals	Residuals	Residuals	Residuals
	Units:	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
Aroclor-1016		<2.4 J	<0.67 J	<0.036	<0.035	<0.15 J	<0.91	<0.20	<0.60
Aroclor-1221		<2.4 J	<1.4 J	<0.073	<0.071	<0.15 J	<0.91	<0.20	<1.2
Aroclor-1232		<2.4 J	<0.67 J	<0.036	<0.035	<0.15 J	<0.91	<0.20	<0.60
Aroclor-1242		29 J	<0.67 J	0.097	0.18	<0.15 J	1.9	3.2	<0.60
Aroclor-1248		28 J	47 DC	<0.036	<0.035	<0.15 J	<0.91	<0.20	<0.60
Aroclor-1254		<2.4 J	<0.67 J	<0.036	<0.035	<0.15 J	2.1	<0.20	<0.60
Aroclor-1260		<2.4 J	R	<0.036	<0.035	0.12 J	<0.91	0.34	<0.60
Total PCBs		57	47	0.097	0.18	0.12	4	3.54	0

mg/kg	Milligrams per kilogram.
PCB	Polychlorinated biphenyls.
ft	Feet.
--	Not available.
D	Compound concentration determined at a secondary dilution factor.
E	Compound concentration exceeded the calibration range of the instrument.
J	Estimated value.
C	Result confirmed by gas chromatography/mass spectrometry.
R	Unusable value.
Dup.	Duplicate.
*	Sample analyzed by U.S. Environmental Protection Agency (USEPA) SW-846 method 8081.

Table 3-8. Detected Compounds in Soil/Residuals - PCBs, July/August 1993, 12th Street Landfill Operable Unit, Plainwell, Michigan.

Sample Location:	SB-2*	SB-4	SB-4	SB-4	SB-4*	SB-4*	SB-4	SB-5
Sample Depth:	22-24 ft	4-6 ft	22-24 ft	24-26 ft	26-28 ft	26-28 ft	26-28 ft	8-10 ft
Sample ID:	T90069	T90077	T90076	T90075	T90072	T90073	T90074	T90095
Sample Date:	08/05/93	08/10/93	08/10/93	08/10/93	08/10/93	08/10/93	08/10/93	08/12/93
Matrix:	Soil	Residuals	Residuals	Residuals	Residuals	Soil	Soil	Residuals
Units:	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
Parameters								
Aroclor-1016	<0.40	0.069 J	<1.6 J	<1.7 J	<0.35 J	<0.074	<0.057 J	1.8 J
Aroclor-1221	<0.82	<0.11 J	<1.6 J	<1.7 J	<0.71 J	<0.15	<0.057 J	<1.8 J
Aroclor-1232	<0.40	<0.11 J	<1.6 J	<1.7 J	<0.35 J	<0.074	<0.057 J	<1.8 J
Aroclor-1242	<0.40	<0.11 J	3.7 J	4.2 J	<0.35 J	<0.074	<0.057 J	<1.8 J
Aroclor-1248	4.3 C	<0.11 J	21 J	20 J	6.6 J	<0.074	<0.057 J	<1.8 J
Aroclor-1254	<0.40	<0.11 J	3.2 J	4.3 J	<0.35 J	<0.074	<0.057 J	5.1 J
Aroclor-1260	1.4 C	0.23 J	1.1 J	0.88 J	0.64 J	<0.074	<0.057 J	<1.8 J
Total PCBs	5.7	0.299	29	29.38	7.24	0	0	6.9

mg/kg	Milligrams per kilogram.
PCB	Polychlorinated biphenyls.
ft	Feet.
--	Not available.
D	Compound concentration determined at a secondary dilution factor.
E	Compound concentration exceeded the calibration range of the instrument.
J	Estimated value.
C	Result confirmed by gas chromatography/mass spectrometry.
R	Unusable value.
Dup.	Duplicate.
*	Sample analyzed by U.S. Environmental Protection Agency (USEPA) SW-846 method 8081.

Table 3-8. Detected Compounds in Soil/Residuals - PCBs, July/August 1993, 12th Street Landfill Operable Unit, Plainwell, Michigan.

Sample Location:	SB-5	SB-5*	SB-5*	SB-6	SB-6	SB-6	SB-6*	MS/MSD SB-6*
Sample Depth:	12-14 ft	20-22 ft	20-22 ft	4-6 ft	14-16 ft	18-20 ft	20-22 ft	20-22 ft
Sample ID:	T90096	T90089	T90090	T90091	T90092	T90093	T90085	T90086
Sample Date:	08/12/93	08/12/93	08/12/93	08/12/93	08/12/93	08/12/93	08/13/93	08/12/93
Matrix:	Soil	Soil	Soil	Residuals	Residuals	Soil	Residuals	Residuals
Units:	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
Parameters								
Aroclor-1016	<0.054	<0.037	<0.036	<0.062	<0.088	<0.16	<0.62	<0.70 J
Aroclor-1221	<0.054	<0.074	<0.073	<0.062	<0.088	<0.16	<1.3	<1.4 J
Aroclor-1232	<0.054	<0.037	<0.036	<0.062	<0.088	<0.16	<0.62	<0.70 J
Aroclor-1242	<0.054	0.034 J	0.05	<0.062	0.18	<0.16	7.7 C	<0.70 J
Aroclor-1248	0.089	<0.037	<0.036	<0.062	<0.088	<0.16	<0.62	18 D
Aroclor-1254	0.024 J	<0.037	<0.036	<0.062	0.71	<0.16	<0.62	<0.70 J
Aroclor-1260	<0.054	<0.037	<0.036	<0.062	0.11	<0.16	<0.62	0.36 J
Total PCBs	0.113	0.034	0.05	0	1	0	7.7	18.36

mg/kg	Milligrams per kilogram.
PCB	Polychlorinated biphenyls.
ft	Feet.
--	Not available.
D	Compound concentration determined at a secondary dilution factor.
E	Compound concentration exceeded the calibration range of the instrument.
J	Estimated value.
C	Result confirmed by gas chromatography/mass spectrometry.
R	Unusable value.
Dup.	Duplicate.
*	Sample analyzed by U.S. Environmental Protection Agency (USEPA) SW-846 method 8081.
MS/MSD	This sample was designated as the matrix spike/matrix spike duplicate sample. This sample was also analyzed without the addition of the matrix spike/matrix spike duplicate compounds.

Table 3-8. Detected Compounds in Soil/Residuals - PCBs, July/August 1993, 12th Street Landfill Operable Unit, Plainwell, Michigan.

Parameters	Sample Location:	SB-6	SB-6*	MS/MSD SB-6*	SB-7	SB-7	SB-7	SB-7	SB-7*
	Sample Depth:	20-22 ft	24-26 ft	24-26 ft	8-10 ft	18-20 ft	20-22 ft	22-24 ft	24-26 ft
	Sample ID:	T90094	T90087	T90088	T90084	T90083	T90082	T90081	T90078
	Sample Date:	08/12/93	08/12/93	08/12/93	08/12/93	08/12/93	08/12/93	08/12/93	08/12/93
	Matrix:	Residuals	Soil	Soil	Residuals	Residuals	Residuals	Residuals	Residuals
	Units:	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
Aroclor-1016		<0.82	<0.035 J	<0.035 J	0.058 J	<55 J	<8.3 J	<2.4 J	<1.8 J
Aroclor-1221		<0.82	<0.071 J	<0.071 J	<0.14 J	<55 J	<8.3 J	<2.4 J	<3.6 J
Aroclor-1232		<0.82	<0.035 J	<0.035 J	<0.14 J	<55 J	<8.3 J	<2.4 J	<1.8 J
Aroclor-1242		8.1	<0.035 J	<0.035 J	<0.14 J	140 J	120 J	50 E	120 C
Aroclor-1248		2.6	<0.035 J	0.082 J	<0.14 J	<55 J	<8.3 J	<2.4 J	<1.8 J
Aroclor-1254		0.86	<0.035 J	<0.035 J	<0.14 J	<55 J	<8.3 J	<2.4 J	<1.8 J
Aroclor-1260		<0.82	<0.035 J	<0.035 J	0.19 J	<55 J	<8.3 J	2.2 J	7.9 C
Total PCBs		11.56	0	0.082	0.248	140	120	52.2	127.9

mg/kg	Milligrams per kilogram.
PCB	Polychlorinated biphenyls.
ft	Feet.
--	Not available.
D	Compound concentration determined at a secondary dilution factor.
E	Compound concentration exceeded the calibration range of the instrument.
J	Estimated value.
C	Result confirmed by gas chromatography/mass spectrometry.
R	Unusable value.
Dup.	Duplicate.
*	Sample analyzed by U.S. Environmental Protection Agency (USEPA) SW-846 method 8081.
MS/MSD	This sample was designated as the matrix spike/matrix spike duplicate sample. This sample was also analyzed without the addition of the matrix spike/matrix spike duplicate compounds.

Table 3-8. Detected Compounds in Soil/Residuals - PCBs, July/August 1993, 12th Street Landfill Operable Unit, Plainwell, Michigan.

Parameters	Sample Location:	SB-7 (Dup)*	SB-7*	MW-1*	MW-1*	MW-2B*	MW-2B*	MW-2B	MW-2B
	Sample Depth:	24-26 ft	24-26 ft	6-8 ft	6-8 ft	3-5 ft	5-6 ft	14-16 ft	24-26 ft
	Sample ID:	T90079	T90080	T90105	T90106	T90029	T90030	T90041	T90042
	Sample Date:	08/12/93	08/12/93	08/17/93	08/17/93	07/30/93	07/30/93	08/03/93	08/03/93
	Matrix:	Residuals	Soil	Residuals	Soil	Residuals	Soil	Soil	Soil
	Units:	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
Aroclor-1016		<0.78 J	<0.85	<0.47	<0.13	<0.057 J	<0.16 J	<0.056 J	<0.059 J
Aroclor-1221		<1.6 J	<1.7	<0.95	<0.26	<1.2 J	<0.34 J	<0.056 J	<0.059 J
Aroclor-1232		<0.7 J	<0.85	<0.47	<0.13	<0.057 J	<0.16 J	<0.056 J	<0.059 J
Aroclor-1242		64 D	4.7	<0.47	0.440	<0.057 J	<0.16 J	<0.056 J	<0.059 J
Aroclor-1248		<0.78 J	<0.85	3.1 CJ	<0.13	22 DC	1.1 J	0.027 J	<0.059 J
Aroclor-1254		<0.78 J	<0.85	2.1 C	<0.13	<0.057 J	<0.16 J	<0.056 J	<0.059 J
Aroclor-1260		R	<0.85	1.5 CJ	<0.13	1.5 J	<0.16 J	<0.056 J	<0.059 J
Total PCBs		64	4.7	6.7	0.44	23.5	1.1	0.027	0

mg/kg Milligrams per kilogram.
PCB Polychlorinated biphenyls.
ft Feet.
-- Not available.
D Compound concentration determined at a secondary dilution factor.
E Compound concentration exceeded the calibration range of the instrument.
J Estimated value.
C Result confirmed by gas chromatography/mass spectrometry.
R Unusable value.
Dup. Duplicate.
* Sample analyzed by U.S. Environmental Protection Agency (USEPA) SW-846 method 8081.

Table 3-8. Detected Compounds in Soil/Residuals - PCBs, July/August 1993, 12th Street Landfill Operable Unit, Plainwell, Michigan.

Sample Location:	MW-3*	MW-3*	MW-3	MW-4B*	MW-4B*	MW-4	MW-5	MW-5
Sample Depth:	2-4 ft	2-4 ft	12-14 ft	2-4 ft	2-4 ft	10-12 ft	0-2 ft	0-2 ft
Sample ID:	T90032	T90033	T90034	T90027	T90028	T90026	T90036	T90039
Sample Date:	07/30/93	07/30/93	07/30/93	08/03/93	08/03/93	07/29/93	07/30/93	07/30/93
Matrix:	Soil	Residuals	Soil	Soil	Residuals	Soil	Soil	Residuals
Units:	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
Parameters								
Aroclor-1016	<0.39	<0.46 J	<0.057	<0.53	<0.10	<0.054	<0.040	<0.56 J
Aroclor-1221	<0.079	<0.94 J	<0.057	<1.1	<0.21	<0.054	<0.082	<1.1 J
Aroclor-1232	<0.039	<0.46 J	<0.057	<0.53	<0.10	<0.054	<0.040	<0.56 J
Aroclor-1242	<0.039	<0.46 J	0.18	<0.53	<0.10	<0.054	<0.040	<0.56 J
Aroclor-1248	0.053 J	4.8 JC	0.044 J	49 DC	0.47 J	0.033 J	0.40	27 D
Aroclor-1254	<0.039	<0.46 J	<0.057	<0.53	0.18 JN	<0.054	<0.040	<0.56 J
Aroclor-1260	<0.039	0.31 JC	<0.057	2.6 C	0.23	<0.054	0.056	1.6 J
Total PCBs	0.053	5.11	0.224	51.6	0.88	0.033	0.456	28.6

mg/kg	Milligrams per kilogram.
PCB	Polychlorinated biphenyls.
ft	Feet.
--	Not available.
D	Compound concentration determined at a secondary dilution factor.
E	Compound concentration exceeded the calibration range of the instrument.
J	Estimated value.
C	Result confirmed by gas chromatography/mass spectrometry.
R	Unusable value.
Dup.	Duplicate.
*	Sample analyzed by U.S. Environmental Protection Agency (USEPA) SW-846 method 8081.

Table 3-8. Detected Compounds in Soil/Residuals - PCBs, July/August 1993, 12th Street Landfill Operable Unit, Plainwell, Michigan.

Sample Location:	MW-5	MW-5	MW-6B	MW-6B	MW-6B	MW-7B	MW-7B	MW-7B (Dup)
Sample Depth:	10-12 ft	20-22 ft	6-8 ft	16-18 ft	22-24 ft	8-10 ft	13-15 ft	13-15 ft
Sample ID:	T90037	T90038	T90043	T90044	T90045	T90046	T90047	T90049
Sample Date:	07/30/93	07/30/93	08/03/93	08/03/93	08/03/93	08/05/93	08/05/93	08/05/93
Matrix:	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil
Units:	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
Parameters								
Aroclor-1016	<0.055	<0.061	<0.037	<0.054 J	<0.053 J	<0.038	<0.055	<0.054
Aroclor-1221	<0.055	<0.061	<0.075	<0.054 J	<0.053 J	<0.076	<0.055	<0.054
Aroclor-1232	<0.055	<0.061	<0.037	<0.054 J	<0.053 J	<0.038	<0.055	<0.054
Aroclor-1242	<0.055	<0.061	<0.037	<0.054 J	<0.053 J	<0.038	<0.055	<0.054
Aroclor-1248	0.060	0.087	<0.037	<0.054 J	<0.053 J	<0.038	<0.055	<0.054
Aroclor-1254	<0.055	<0.061	<0.037	<0.054 J	<0.053 J	<0.038	<0.055	<0.054
Aroclor-1260	<0.055	<0.061	<0.037	<0.054 J	<0.053 J	<0.038	<0.055	<0.054
Total PCBs	0.06	0.087	0	0	0	0	0	0

mg/kg	Milligrams per kilogram.
PCB	Polychlorinated biphenyls.
ft	Feet.
--	Not available.
D	Compound concentration determined at a secondary dilution factor.
E	Compound concentration exceeded the calibration range of the instrument.
J	Estimated value.
C	Result confirmed by gas chromatography/mass spectrometry.
R	Unusable value.
Dup.	Duplicate.
*	Sample analyzed by U.S. Environmental Protection Agency (USEPA) SW-846 method 8081.

Table 3-8. Detected Compounds in Soil/Residuals - PCBs, July/August 1993, 12th Street Landfill Operable Unit, Plainwell, Michigan.

Sample Location:	MW-7B	MW-8B
Sample Depth:	24-26 ft	30-32
Sample ID:	T90048	T90103
Sample Date:	08/05/93	08/17/93
Matrix:	Soil	Soil
Units:	mg/kg	mg/kg
Parameters		
Aroclor-1016	<0.28	<0.18
Aroclor-1221	<0.28	<0.036
Aroclor-1232	<0.28	<0.073
Aroclor-1242	1.7	<0.036
Aroclor-1248	<0.28	<0.036
Aroclor-1254	<0.28	<0.036
Aroclor-1260	<0.28	<0.036
Total PCBs	1.7	0

mg/kg	Milligrams per kilogram.
PCB	Polychlorinated biphenyls.
ft	Feet.
--	Not available.
D	Compound concentration determined at a secondary dilution factor.
E	Compound concentration exceeded the calibration range of the instrument.
J	Estimated value.
C	Result confirmed by gas chromatography/mass spectrometry.
R	Unusable value.
Dup.	Duplicate.
*	Sample analyzed by U.S. Environmental Protection Agency (USEPA) SW-846 method 8081.

Table 3-9. Concentration Ranges of Chemicals Detected in Samples of Soil and Residuals, 12th Street Landfill Operable Unit, Plainwell, Michigan

Chemical	Concentrations in Soil (mg/kg)	Concentrations in Residuals (mg/kg)
VOCs		
Acetone	ND - 0.90	ND - 2.5
Benzene	ND - 0.046	ND - 0.060
2-Butanone (MEK)	ND - 0.29	ND - 1.6
Carbon disulfide	ND - 0.035	ND - 0.095
Chlorobenzene	ND	ND - 0.012
1,2-Dichloroethene (total)	ND	ND - 0.01
Ethylbenzene	ND - 0.04	ND - 2
2-Hexanone	ND	ND - 0.033
4-Methyl-2-pentanone	ND	ND - 0.024
Tetrachloroethene	ND	ND - 0.093
Toluene	ND - 0.014	ND - 29
Trichloroethene	ND	ND - 0.02
Styrene	ND	ND - 0.14
Xylenes (total)	ND - 0.26	ND - 1.5
SVOCs		
Acenaphthylene	ND	ND - 0.022
Anthracene	ND - 0.065	ND - 0.071
Benzo(a)anthracene	ND - 0.21	ND - 0.23
Benzo(a)pyrene	ND - 0.20	ND - 0.21
Benzo(b)fluoranthene	ND - 0.20	ND - 0.26
Benzo(g,h,i)perylene	ND - 0.032	ND - 0.07
Benzo(k)fluoranthene	ND - 0.22	ND - 0.22
Carbazole	ND - 0.019	ND - 0.073
4-Chloro-3-methyl phenol	ND	ND - 1.4
Chrysene	ND - 0.25	ND - 0.3
Dibenzofuran	ND	ND - 0.11
1,2-Dichlorobenzene	ND	ND - 0.72
Diethylphthalate	ND - 0.070	ND - 0.46
Di-n-butylphthalate	ND - 0.040	ND - 0.089
bis(2-Ethylhexyl)phthalate	ND	ND - 17
Fluoranthene	ND - 0.39	ND - 0.47
Fluorene	ND	ND - 0.044
Ideno(1,2,3-cd)pyrene	ND - 0.066	ND - 0.094

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Table 3-9. Concentration Ranges of Chemicals Detected in Samples of Soil and Residuals, 12th Street Landfill Operable Unit, Plainwell, Michigan

Chemical	Concentrations in Soil (mg/kg)	Concentrations in Residuals (mg/kg)
SVOCs, continued		
2-Methylnaphthalene	ND - 2.1	ND - 38
2-Methylphenol	ND	ND - 100
4-Methylphenol	ND - 0.022	ND - 260
Napthalene	ND - 0.13	ND - 5.9
Pentachlorophenol	ND	ND - 13
Phenanthrene	ND - 0.58	ND - 4.2
Pyrene	ND - 0.34	ND - 0.35
2,4,5-Trichlorophenol	ND	ND - 5.8
2,4,6-Trichlorophenol	ND	ND - 0.26
Pesticides		
Aldrin	ND - 0.11	ND - 4.4
alpha-BHC	ND	ND - 0.0036
beta-BHC	ND - 0.026	ND - 2
delta-BHC	ND	ND - 0.0047
gamma-BHC (lindane)	ND - 0.0089	ND - 1.6
alpha-Chlordane	ND - 0.13	ND - 19
gamma-Chlordane	ND - 0.0031	ND - 20
4,4'-DDD	ND - 0.13	ND - 35
4,4'-DDE	ND - 0.68	ND - 32
4,4'-DDT	ND - 0.46	ND - 75
Dieldrin	ND	ND - 17
Endosulfan I	ND - 0.0037	ND - 75
Endosulfan II	ND	ND - 34
Endosulfan sulfate	ND	ND - 9.7
Endrin	ND - 0.006	ND - 8.4
Endrin aldehyde	ND	ND - 0.015
Endrin ketone	ND	ND - 0.76
Heptachlor	ND - 0.0018	ND - 16
Methoxychlor	ND	ND - 110
PCBs	ND - 51.6	ND - 158

Table 3-9. Concentration Ranges of Chemicals Detected in Samples of Soil and Residuals, 12th Street Landfill Operable Unit, Plainwell, Michigan

Chemical	Concentrations in Soil (mg/kg)	Concentrations in Residuals (mg/kg)
Inorganics		
Aluminum	1610 - 20,500	4070 - 15,200
Antimony	ND - 23.5	ND - 24.6
Arsenic	ND - 25.4	0.57 - 41.5
Barium	10.1 - 364	26.5 - 796
Beryllium	ND - 0.86	ND - 8.8
Cadmium	ND - 1.5	ND - 4.2
Calcium	497 - 181,000	1130 - 375,000
Chromium	3 - 115	7.2 - 173
Cobalt	ND - 14.9	ND - 18.4
Copper	2.7 - 98.4	21.9 - 297
Iron	3450 - 30,100	477 - 17,800
Lead	1.2 - 457	6.6 - 946
Magnesium	540 - 86,900	358 - 18,400
Manganese	16.5 - 2,980	5.4 - 462
Mercury	ND - 2.2	ND - 5.2
Nickel	ND - 28.4	2.1 - 30.9
Potassium	ND - 2,050	ND - 920
Selenium	ND - 7.8	ND - 5.3
Silver	ND - 2.3	ND - 2.0
Sodium	ND - 713	ND - 519
Thallium	ND	ND - 1.4
Vanadium	4.7 - 49.4	5.4 - 57.3
Zinc	7.7 - 319	102 - 1130
Cyanide	ND - 2.1	ND - 18.1

ND Not Detected.

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Table 3-10. Detected Compounds in Groundwater/Leachate - Volatile Organic Compounds, September 1993, 12th Street Landfill Operable Unit, Plainwell, Michigan.

Sample Location:	MW-1	MW-2A	MW-2A (Dup)	MW-2B	MW-3A	MW-3A (Dup)	MW-3B	MW-4A
Sample ID:	T94009	T94003	T94004	T94002	T94015	T94014	T94016	T94000
Sample Date:	09/10/93	09/08/93	09/08/93	09/08/93	09/14/93	09/14/93	09/14/93	09/07/93
Units:	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Parameter								
Methylene chloride	<0.010	<0.010 J	<0.010 J	<0.010 J	<0.010 J	<0.010 J	0.001 J	<0.010 J
Acetone	<0.010	<0.010 J	<0.010 J	<0.010 J	<0.010 J	<0.010 J	0.014 J	<0.010 J
Carbon disulfide	<0.010	<0.010 J	<0.010 J	<0.010 J	<0.010 J	<0.010 J	<0.010 J	<0.010 J
2 Butanone	<0.010	<0.010 J	<0.010 J	<0.010 J	<0.010 J	<0.010 J	<0.010 J	<0.010 J
Trichloroethene	<0.010	<0.010 J	<0.010 J	<0.010 J	<0.010 J	<0.010 J	<0.010 J	<0.010 J
Benzene	<0.010	<0.010 J	<0.010 J	<0.010 J	<0.010 J	<0.010 J	0.001 J	<0.010 J
4 Methyl 2 pentanone	<0.010 J	<0.010 J	<0.010 J	<0.010 J	<0.010 J	<0.010 J	<0.010 J	<0.010 J
Tetrachloroethene	<0.010	<0.010 J	<0.010 J	<0.010 J	<0.010 J	<0.010 J	<0.010 J	<0.010 J
Toluene	<0.010	<0.010 J	<0.010 J	<0.010 J	<0.010 J	<0.010 J	<0.010 J	<0.010 J
Ethylbenzene	<0.010	<0.010 J	<0.010 J	<0.010 J	<0.010 J	<0.010 J	<0.010 J	<0.010 J
Xylene (total)	<0.010	<0.010 J	<0.010 J	<0.010 J	<0.010 J	<0.010 J	<0.010 J	<0.010 J

Dup Duplicate.
mg/L Milligrams per liter.
J Estimated value.
D Compound determined at a secondary dilution factor.

Table 3-10. Detected Compounds in Groundwater/Leachate - Volatile Organic Compounds, September 1993, 12th Street Landfill Operable Unit, Plainwell, Michigan.

Sample Location:	MW-8B	LH-1	LH-2	LH-3
Sample ID:	T94012	T94019	T94020	T94018
Sample Date:	09/13/93	09/16/93	09/16/93	09/15/93
Units:	mg/L	mg/L	mg/L	mg/L
Parameter				
Methylene chloride	<0.010 J	<0.010	<0.010	0.001 J
Acetone	<0.010 J	0.040	1.10 D	0.52 D
Carbon disulfide	<0.010 J	<0.010	0.002 J	<0.010 J
2-Butanone	<0.010 J	<0.010	0.62 D	0.41 DJ
Trichloroethene	<0.010 J	<0.010	0.002 J	<0.010 J
Benzene	<0.010 J	0.002 J	0.003 J	0.007 J
4-Methyl-2-pentanone	<0.010 J	<0.010	0.006 J	<0.010 J
Tetrachloroethene	<0.010 J	<0.010	0.002 J	<0.010 J
Toluene	<0.010 J	0.005 J	0.68 D	0.066 J
Ethylbenzene	<0.010 J	0.002 J	0.008 J	0.002 J
Xylene (total)	<0.010 J	0.005 J	0.006 J	0.010 J

Dup Duplicate.
mg/L Milligrams per liter.
J Estimated value.
D Compound determined at a secondary dilution factor.

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Table 3-10. Detected Compounds in Groundwater/Leachate - Volatile Organic Compounds, September 1993, *12th Street Landfill Operable Unit, Plainwell, Michigan.*

Sample Location:	MW-4B	MW-5A	MW-5B	MW-6A	MW-6B	MW-7A	MW-7B	MW-8A
Sample ID:	T94001	T94007	T94008	T94006	T94005	T94011	T94010	T94013
Sample Date:	09/07/93	09/10/93	09/10/93	09/09/93	09/09/93	09/13/93	09/13/93	09/13/93
Units:	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Parameter								
Methylene chloride	<0.010 J	<0.010	<0.010	<0.010 J	<0.010 J	<0.010 J	<0.010 J	<0.010 J
Acetone	<0.010 J	<0.010	<0.010	<0.010 J	<0.010 J	<0.010 J	<0.010 J	<0.010 J
Carbon disulfide	<0.010 J	<0.010	<0.010	<0.010 J	<0.010 J	<0.010 J	<0.010 J	<0.010 J
2 Butanone	<0.010 J	<0.010	<0.010	<0.010 J	<0.010 J	<0.010 J	<0.010 J	<0.010 J
Trichloroethene	<0.010 J	<0.010	<0.010	<0.010 J	<0.010 J	<0.010 J	<0.010 J	<0.010 J
Benzene	<0.010 J	<0.010	<0.010	<0.010 J	<0.010 J	<0.010 J	<0.010 J	<0.010 J
4 Methyl-2 pentanone	<0.010 J	<0.010 J	<0.010 J	<0.010 J	<0.010 J	<0.010 J	<0.010 J	<0.010 J
Tetrachloroethene	<0.010 J	<0.010	<0.010	<0.010 J	<0.010 J	<0.010 J	<0.010 J	<0.010 J
Toluene	<0.010 J	<0.010	<0.010	<0.010 J	<0.010 J	<0.010 J	<0.010 J	<0.010 J
Ethylbenzene	<0.010 J	<0.010	<0.010	<0.010 J	<0.010 J	<0.010 J	<0.010 J	<0.010 J
Xylene (total)	<0.010 J	<0.010	<0.010	<0.010 J	<0.010 J	<0.010 J	<0.010 J	<0.010 J

Dup Duplicate.
mg/L Milligrams per liter.
J Estimated value.
D Compound determined at a secondary dilution factor.

Table 3-11. Detected Compounds in Groundwater/Leachate - Semivolatile Organic Compounds, September 1993, 12th Street Landfill Operable Unit, Plainwell, Michigan

Sample Location:	MW-1	MW-2A	MW-2A (Dup)	MW-2B	MW-3A	MW-3A (Dup)	MW-3B	MW-4A
Sample ID:	T94009	T94003	T94004	T94002	T94015	T94014	T94016	T94000
Sample Date:	09/10/93	09/08/93	09/08/93	09/08/93	09/14/93	09/14/93	09/14/93	09/07/93
Units:	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Parameter								
4-Methylphenol	<0.010	<0.010	<0.010	<0.010	<0.010	<0.067	<0.010	<0.010
Naphthalene	<0.010	<0.010	<0.010	<0.010	<0.010	<0.067	<0.010	<0.010
2-Methylnaphthalene	<0.010	<0.010	<0.010	<0.010	<0.010	<0.067	<0.010	<0.010
bis(2-Ethylhexyl)phthalate	<0.010	<0.010	<0.010	<0.010	0.028	0.29	<0.010	<0.010

Dup Duplicate.
mg/L Milligrams per liter.
J Estimated value.

Table 3-11. Detected Compounds in Groundwater/Leachate - Semivolatile Organic Compounds, September 1993, 12th Street Landfill Operable Unit, Plainwell, Michigan

Sample Location:	MW-4B	MW-5A	MW-5B	MW-6A	MW-6B	MW-7A	MW-7B	MW-8A
Sample ID:	T94001	T94007	T94008	T94006	T94005	T94011	T94010	T94013
Sample Date:	09/07/93	09/10/93	09/10/93	09/09/93	09/09/93	09/13/93	09/13/93	09/13/93
Units:	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Parameter								
2-Methylphenol	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Naphthalene	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
2-Methylnaphthalene	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
bis(2-Ethylhexyl)phthalate	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010

Dup Duplicate.
mg/L Milligrams per liter.
J Estimated value.

Table 3-11. Detected Compounds in Groundwater/Leachate - Semivolatile Organic Compounds, September 1993, 12th Street Landfill Operable Unit, Plainwell, Michigan

Sample Location:	MW-8B	LH-1	LH-2	LH-3
Sample ID:	T94012	T94019	T94020	T94018
Sample Date:	09/13/93	09/16/93	09/16/93	09/15/93
Units:	mg/L	mg/L	mg/L	mg/L
Parameter				
4-Methylphenol	<0.010	0.030 J	14	5.8
Naphthalene	<0.010	0.010 J	<2.5	<1.0
2-Methylnaphthalene	<0.010	0.017 J	<2.5	<1.0
bis(2-Ethylhexyl)phthalate	<0.010	<0.033	<2.5	<1.0

Dup Duplicate.
mg/L Milligrams per liter.
J Estimated value.

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Table 3-12. Detected Compounds in Groundwater/Leachate - Pesticides and PCBs, September 1993, 12th Street Landfill Operable Unit, Plainwell, Michigan.

Sample Location:	MW-1	MW-2A	MW-2A (Dup)	MW-2B	MW-3A	MW-3A (Dup)	MW-3B	MW-4A	MW-4B
Sample ID:	T94009	T94003	T94004	T94002	T94015	T94014	T94016	T94000	T94001
Sample Date:	09/10/93	09/08/93	09/08/93	09/08/93	09/14/93	09/14/93	09/14/93	09/07/93	09/07/93
Units:	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Parameters									
Aldrin	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.000025

Dup Duplicate.
mg/L Milligrams per liter.
PCBs Polychlorinated biphenyls.
J Estimated value.
R Unusable value.
Z Compound coelutes with aroclor peaks on one or both columns.
Results are for unfiltered samples.

Table 4-3. Detected Compound Concentrations and Cleanup Criteria of Organic and Inorganic Compounds in Subsurface Soil, 12th Street Landfill Operable Unit, Plainwell, Michigan.

Compound	Frequency Detected	Range of Concentrations (mg/kg)	Maximum Upgradient Concentrations (A) (mg/kg)	Type A Cleanup Criteria Acceptable Concentrations (mg/kg)	Type B Cleanup Criteria 20X Drinking Water Value (mg/kg)	Type B Cleanup Criteria 20X GSI Value (mg/kg)
Inorganic Constituents						
Aluminum	16/16	1610 - 14700	1940 (6)	6900 (3)	1.0 (C) (16)	(C,D)
Antimony	2/16	8.4 - 23.5	ND (2)	NA	0.048 (C) (2)	86
Arsenic	15/16	1.1 - 23.8	4.3 (2)	5.8 (7)	0.0004 (15)	0.028 (15)
Barium	16/16	10.1 - 364	14.5 (8)	75 (7)	48 (C) (8)	12.6 (14)
Beryllium	12/16	0.12 - 0.75	0.14 (1)	NA	NA	NA
Calcium	16/16	497 - 181000	133000	NA	NA	NA
Chromium	16/16	3 - 115	7.1 (4)	18 (4)	2.4 (C) (16)	0.15 (16)
Cobalt	14/16	1.3 - 14.9	3 (2)	NA	NA	NA
Copper	16/16	2.7 - 98.4	6.8 (4)	32 (3)	20 (C) (4)	0.37 (C) (16)
Iron	16/16	3450 - 28100	12900	12000 (6)	6.0 (C) (16)	(D)
Lead	16/16	1.2 - 457	4.9 (5)	21 (3)	0.08 (16)	0.16 (16)
Magnesium	16/16	540 - 49100	38800	NA	NA	NA
Manganese	16/16	16.5 - 1040	408	440 (4)	1.0 (C) (16)	(D)
Mercury	5/17	0.06 - 2.2	ND (5)	0.13 (4)	0.042 (C) (5)	0.000026 (C) (5)
Nickel	16/16	3.5 - 22	6.9 (1)	20 (1)	11 (C) (4)	1.1 (C) (16)
Potassium	9/16	93.1 - 1260	234 (2)	NA	NA	NA
Selenium	9/16	0.47 - 7.8	0.74 (2)	0.41 (9)	0.7 (C) (5)	0.44 (C) (9)
Silver	1/16	2.3	ND (1)	1.0 (1)	0.66 (C) (1)	0.002 (C) (1)
Sodium	9/16	117 - 713	192 (3)	NA	3000 (C)	(D)
Vanadium	16/16	4.7 - 47.9	8.5 (2)	NA	1.2 (C) (16)	0.16 (C) (16)
Zinc	16/16	7.7 - 319	14.4 (5)	47 (5)	46 (C) (5)	1.6 (C) (16)
Cyanide	5/16	0.33 - 2.1	0.05 (5)	0.39 (4)	3.0 (C)	0.11 (C) (5)

Footnotes on last page of table.

Table 4-3. Detected Compound Concentrations and Cleanup Criteria of Organic and Inorganic Compounds in Subsurface Soil, 12th Street Landfill Operable Unit, Plainwell, Michigan.

NA Not available.
GSI Groundwater- surface-water interface.
mg/kg Milligrams per kilogram.
ND Not detected above quantitation limit.
(1) Number of samples for which criterion was exceeded.
(A) Includes results from MW-8B.
(C) Background may be substituted as the cleanup criteria if higher than Type B criterion.
(D) Chemical is being evaluated by the Michigan Department of Natural Resources. Potentially responsible parties may propose a GSI value.
(G) Chemical, due to its physicochemical properties, is not expected to leach through soils to groundwater under most conditions.

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Table 3-14. Detected Constituents in Groundwater/Leachate - Wet Chemistry, September 1993, 12th Street Landfill Operable Unit, Plainwell, Michigan.

Sample Location:	MW-1	MW-2A	MW-2A (Dup)	MW-2B	MW-3A	MW-3A (Dup)	MW-3B	MW-4A	MW-4B	MW-5A
Sample ID:	T94009	T94003	T94004	T94002	T94015	T94014	T94016	T94000	T94001	T94007
Sample Date:	09/09/93	09/07/93	09/07/93	09/07/93	09/14/93	09/14/93	09/14/93	09/06/93	09/06/93	09/09/93
Units:	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Lab Parameters										
Sodium + Potassium	R	15.2	15.9	15.5	15.5	15.4	14.3	25.8	19.1	18.8
Calcium	94.6	80.8	81.1	78.1	87.3	88.6	74.6	102	82.3	105
Magnesium	28.1	24.4	24.5	23.7	27.4	27.7	23	26.4	24.2	23.7
Iron	0.649	<0.0289	<0.028	<0.0281	0.37	0.383	<0.0119	2.13	<0.0281	4.09
Chloride	35	36	35	30	25	43	25	31	39	36
Sulfate	17	20	18	20	17	19	22	20	23	14
Bicarbonate alkalinity	340	270	270	260	310	310	250	350	270	330
Nitrate/nitrite nitrogen	0.58	0.75	0.84	0.87	0.22	0.22	0.90	0.51	0.70	0.21
Chemical oxygen demand	5.2	<5	<5	<5	<5	<5	<5	27	5.2	<5
Hydroxide alkalinity	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Carbonate alkalinity	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Total alkalinity	340	270	270	260	310	310	250	350	270	330
Total suspended solids	15.4 J	<0.5	<0.5	<0.5	1.5	1.4	0.6	44	0.8	11.6 J
Organic carbon, total	1.1	0.6	0.6	0.6	0.8	0.9	0.6	1.7	0.6	1.0
Field Parameters										
Purge Volume (gal)	7	8		5	12		7	15	6	8
pH	6.91	6.97		6.88	6.49		6.44	6.56	7.17	6.66
Conductivity (mS/cm)	0.626	0.535		0.518	0.566		0.483	0.69	0.539	0.656
Turbidity (NTU)	0	2		2	7		6	34	4	0
Dissolved Oxygen (mg/L)	1.99	2.06		3.13	1.35		3.06	2	2.66	2.92
Temperature (in Celsius)	15	14.5		12.5	15.7		15	12.9	12.6	11.9

mg/L Milligrams per liter.
J Estimated value.
Dup Duplicate.
Field parameters measured with a Horiba U-10 Water Quality Checker.

Table 3-13. Detected Constituents in Groundwater/Leachate - Inorganic Constituents, September 1993, 12th Street Landfill Operable Unit, Plainwell, Michigan.

Sample Location:	MW-8B	MW-8B	LH-1	LH-1	LH-2	LH-2	LH-3	LH-3
Sample ID:	T94012	T94012F	T94019	T94019F	T94020	T94020F	T94018	T94018F
Sample Date:	09/13/93	09/13/93	09/16/93	09/16/93	09/16/93	09/16/93	09/15/93	09/15/93
Units:	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
	Total	Dissolved	Total	Dissolved	Total	Dissolved	Total	Dissolved
Analyte								
Aluminum	<0.0971	<0.0726	0.0536	<0.0449	11.9 J	17.3 J	0.352	<0.0724
Antimony	<0.0528	<0.0499	<0.0527	<0.0528	<0.0528	<0.0525	<0.0521	0.0541 B
Arsenic	<0.0012	<0.0019	<0.0012	<0.00099	<0.012 J	0.0156	0.0038 B	0.0026 BJ
Barium	0.0713 B	0.066 B	0.999	0.898	7.7 J	9.46 J	2.85	2.64
Beryllium	<0.0003	<0.0009	<0.0003	<0.0003	<0.0009	0.0016 B	<0.0003	<0.0009
Calcium	73.2	70.6	385	360	882	863	636	660
Chromium	<0.0025	<0.0027	0.015	<0.0025	0.0353	0.0231	0.0431	0.0135
Cobalt	<0.0049	<0.0055	0.0129 B	0.0083 B	0.0106 B	0.0072 B	0.0157 B	0.0252 B
Copper	<0.0037	<0.0047	0.0092	0.0037	<0.0067	<0.0037	<0.0052	<0.0047
Iron	0.465	<0.0281	80.7	74.2	232	262	124	101
Lead	<0.0006	0.0008 B	0.0341	<0.00079	<0.0006	<0.0008 J	<0.0024 J	0.0013 B
Magnesium	22.4	21.5	116	109	118	99.4	R	R
Manganese	0.0374	0.0034 B	0.466	0.427	2.84	2.86	2.29	2.41
Mercury	<0.00007	<0.00009	0.00018 B	<0.00007	<0.00007	<0.00007	<0.00007	<0.00009
Nickel	<0.0041	<0.0075	0.0069 B	0.0046 B	0.0339 B	0.0167 B	0.0555	0.0416
Potassium	1.96 B	1.97 B	57.3	56.5	22.7	21.3	17.4	15.3
Sodium	20.8	19.6	155	144	164	104	136 J	166 J
Vanadium	<0.0033	<0.0068	0.0061 B	<0.0033	0.0417 B	0.0408 B	0.0111 B	<0.0068
Zinc	<0.0066	<0.0178	0.0324	<0.0185	0.129	0.0482	R	R
Cyanide	<0.0012	NA	0.016	NA	<0.0016	NA	0.0119	NA

mg/L Milligrams per liter.

B Compound concentration is between instrument detection limit and the contract required quantitation limit.

NA Not analyzed.

R Unusable value.

J Estimated value.

Dup Duplicate.

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Table 3-13. Detected Constituents in Groundwater/Leachate - Inorganic Constituents, September 1993, 12th Street Landfill Operable Unit, Plainwell, Michigan.

Sample Location:	MW-6B	MW-6B	MW-7A	MW-7A	MW-7B	MW-7B	MW-8A	MW-8A
Sample ID:	T94005	T94005F	T94011	T94011F	T94010	T94010F	T94013	T94013F
Sample Date:	09/09/93	09/09/93	09/13/93	09/13/93	09/13/93	09/13/93	09/13/93	09/13/93
Units:	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
	Total	Dissolved	Total	Dissolved	Total	Dissolved	Total	Dissolved
Analyte								
Aluminum	<0.0727	<0.0721	<0.0892	<0.0724	<0.0447	<0.0724	<0.0448	<0.0727
Antimony	<0.0500	<0.0496	<0.0524	<0.0498	<0.0526	<0.0498	<0.0527	<0.050
Arsenic	<0.0014	<0.0019	<0.0012	<0.0019	<0.0012	<0.0019	<0.0012	<0.0019
Barium	0.0775 B	0.0784 B	0.0725 B	0.0699 B	0.0808 B	0.0744 B	0.0566 B	0.0567 B
Beryllium	<0.00090	<0.00089	<0.0003	<0.0009	<0.0003	<0.0009	<0.0003	<0.0009
Calcium	80.5	77.1	82.1	82.0	133	129	77.7	80.0
Chromium	<0.0027	<0.0027	<0.0025	<0.0027	<0.0025	<0.0027	<0.0025	<0.0027
Cobalt	<0.0055	<0.0055	<0.0049	<0.0055	<0.0049	0.0055 B	<0.0049	<0.0055
Copper	<0.0047	<0.0047	<0.0037	<0.0047	<0.0037	<0.0047	<0.0037	<0.0047
Iron	<0.0376	<0.0280	0.472	<0.0281	<0.182	<0.042	<0.0114	<0.0282
Lead	<0.0008	<0.0008	<0.0006	0.0008 B	<0.0006	0.00083 B	<0.0006	0.00082 B
Magnesium	24.6	23.8	23.9	24.0	28.6	27.8	21.6	22.3
Manganese	<0.0074	0.0022 B	0.11	<0.002	0.443	0.423	<0.0039	<0.002
Mercury	<0.00009	<0.00009	<0.00007	<0.00009	<0.00007	<0.00009	<0.00007	<0.00009
Nickel	<0.0075	<0.0074	<0.0041	<0.0075	<0.00041	<0.0075	<0.0041	<0.0075
Potassium	1.68 B	0.983 B	1.86 B	1.18 B	2.14 B	2.2 B	1.85 B	1.45 B
Sodium	23.2	23.2	21.9	21.4	23.5	22.5	16.1	16.2
Vanadium	<0.0068	<0.0067	<0.0033	<0.0068	<0.0033	<0.0068	<0.0033	<0.0068
Zinc	<0.0264	<0.0276	<0.0074	<0.0115	0.0303	<0.0187	<0.0101	<0.0123
Cyanide	<0.0012	NA	<0.0012	NA	<0.0012	NA	<0.0012	NA

mg/L Milligrams per liter.
B Compound concentration is between instrument detection limit and the contract required quantitation limit.
NA Not analyzed.
R Unusable value.
J Estimated value.
Dup Duplicate.

Table 3-13. Detected Constituents in Groundwater/Leachate - Inorganic Constituents, September 1993, 12th Street Landfill Operable Unit, Plainwell, Michigan.

Sample Location:	MW-4B	MW-4B	MW-5A	MW-5A	MW-5B	MW-5B	MW-6A	MW-6A
Sample ID:	T94001	T94001F	T94007	T94007F	T94008	T94008F	T94006	T94006F
Sample Date:	09/07/93	09/07/93	09/10/93	09/10/93	09/10/93	09/10/93	09/09/93	09/09/93
Units:	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Analyte	Total	Dissolved	Total	Dissolved	Total	Dissolved	Total	Dissolved
Aluminum	<0.0723	<0.0725	0.0722	0.0726	<0.0727	<0.0723	0.07210	0.0725
Antimony	<0.0498	<0.0499	0.0496	0.0499	<0.050	<0.0497	<0.0496	<0.0499
Arsenic	<0.0014	<0.0019	0.0047 B	0.0057 B	<0.0014	<0.0019	<0.0014	<0.0019
Barium	0.0795 B	0.0757 B	0.295	0.283	0.0696 B	0.0698 B	0.0696 B	0.0693 B
Beryllium	<0.00090	<0.00090	0.00089	<0.0009	<0.0009	<0.00089	<0.00089	<0.0009
Calcium	82.3	86.2	105	99.1	74.3	72.5	85.2	82.7
Chromium	<0.0027	<0.0027	<0.0027	<0.0027	<0.0027	<0.0027	<0.0027	<0.0027
Cobalt	<0.0055	<0.0055	<0.0055	0.0079 B	<0.0055	<0.0055	<0.0055	<0.0055
Copper	0.0057 B	<0.0065	<0.0047	<0.0047	<0.0047	<0.0047	<0.0047	<0.0047
Iron	<0.0281	<0.0281	4.09	3.82	<0.0483	<0.028	<0.0293	0.0281
Lead	<0.00080	0.0012 B	<0.0008	<0.0008	<0.0012	0.0014 B	<0.00079	<0.00079
Magnesium	24.2	22.4	23.7	22.4	22.2	22.0	24.7	24.2
Manganese	0.0191	0.0169	1.25	1.15	0.0392	0.0309	0.0219	0.0068 B
Mercury	<0.00009	<0.00009	<0.00009	<0.00009	<0.00009	<0.00009	<0.00009	<0.00009
Nickel	<0.0075	<0.0075	<0.0074	<0.0075	<0.0075	<0.0075	<0.0074	<0.0075
Potassium	1.28 B	1.02 B	1.03 B	1.11 B	1.43 B	0.85 B	1.06 B	1.1 B
Sodium	17.8	16.9	17.8	17.5	13.8	13.7	22.2	21.8
Vanadium	<0.0068	<0.0068	<0.0068	<0.0068	<0.0068	<0.0068	<0.0067	<0.0068
Zinc	<0.0113	<0.0266	<0.0126	<0.0256	<0.0082	<0.0187	<0.024	<0.036
Cyanide	<0.0012	NA	<0.0012	NA	<0.0012	NA	<0.0012	NA

mg/L Milligrams per liter.
B Compound concentration is between instrument detection limit and the contract required quantitation limit.
NA Not analyzed.
R Unusable value.
J Estimated value.
Dup Duplicate.

Table 3-13. Detected Constituents in Groundwater/Leachate - Inorganic Constituents, September 1993, 12th Street Landfill Operable Unit, Plainwell, Michigan.

Sample Location:	MW-3A	MW-3A (Dup)	MW-3A	MW-3A (Dup)	MW-3B	MW-3B	MW-4A	MW-4A
Sample ID:	T94015	T94014	T94015F	T94014F	T94016	T94016F	T94000	T94000F
Sample Date:	09/14/93	09/14/93	09/14/93	09/14/93	09/14/93	09/14/93	09/07/93	09/07/93
Units:	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Analyte	Total	Total	Dissolved	Dissolved	Total	Dissolved	Total	Dissolved
Aluminum	<0.0446	<0.0446	<0.0727	<0.0722	<0.0449	<0.0725	0.0816 B	<0.0723
Antimony	<0.0524	<0.0525	<0.050	<0.0496	<0.0528	<0.0498	<0.0497	<0.0497
Arsenic	<0.0012	<0.0012	0.002 B	<0.0019	<0.0012	<0.0019	0.0049 B	0.005 B
Barium	0.476	0.484	0.449	0.453	0.104 B	0.101 B	0.249	0.226
Beryllium	<0.0003	<0.0003	<0.0009	<0.00089	<0.0003	<0.0009	<0.00089	<0.00089
Calcium	87.3	88.6	85.9	86.0	74.6	73.5	102	92.9
Chromium	<0.0025	<0.0025	<0.0027	<0.0027	<0.0025	<0.0027	<0.0027	<0.0027
Cobalt	<0.0049	<0.0049	<0.0055	<0.0055	<0.0049	0.0067 B	<0.0055	<0.0055
Copper	<0.0037	<0.0037	<0.0047	<0.0047	<0.0057	0.0111	<0.0047	<0.0047
Iron	0.37	0.383	<0.363	<0.362	<0.0119	0.0281	2.13	1.26
Lead	<0.0006	<0.0006	<0.0008	<0.0008	<0.0006	<0.00079	<0.0016	<0.00079
Magnesium	27.4	27.7	26.9	26.9	23	22.8	26.4	24.5
Manganese	1.1	1.11	1.03	1.04	0.0201	0.0177	0.625	0.585
Mercury	<0.00007	<0.00007	<0.00009	<0.00009	<0.00007	<0.00009	<0.00009	<0.00009
Nickel	<0.0041	<0.0041	<0.0075	<0.0074	<0.0041	<0.0075	<0.0075	<0.0075
Potassium	1.54 B	1.09 B	0.948 B	1.21 B	1.18 B	1.19 B	1.56 B	1.84 B
Sodium	14.0	14.3	13.7	13.7	13.1	12.6	24.2	21.9
Vanadium	<0.0033	<0.0033	<0.0068	<0.0068	<0.0033	<0.0068	<0.0068	<0.0068
Zinc	0.0063 B	0.007 B	<0.0125	<0.0133	0.0070 B	<0.0082	0.0562	<0.0458
Cyanide	<0.0012	<0.0012	NA	NA	<0.0012	NA	<0.0012	NA

mg/L Milligrams per liter.

B Compound concentration is between instrument detection limit and the contract required quantitation limit.

NA Not analyzed.

R Unusable value.

J Estimated value.

Dup Duplicate.

Table 3-13. Detected Constituents in Groundwater/Leachate - Inorganic Constituents, September 1993, 12th Street Landfill Operable Unit, Plainwell, Michigan.

Sample Location:	MW-1	MW-1	MW-2A	MW-2A (Dup)	MW-2A	MW-2A (Dup)	MW-2B	MW-2B
Sample ID:	T94009	T94009F	T94003	T94004	T94003F	T94004F	T94002	T94002F
Sample Date:	09/10/93	09/11/93	09/08/93	09/08/93	09/08/93	09/08/93	09/08/93	09/08/93
Units:	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Analyte	Total	Dissolved	Total	Total	Dissolved	Dissolved	Total	Dissolved
Aluminum	<0.0726	<0.0725	<0.0722	<0.0722	<0.0721	<0.072	<0.0725	<0.0723
Antimony	<0.050	<0.0499	<0.0497	<0.0497	<0.0496	<0.0495	<0.0498	<0.0498
Arsenic	<0.0014	0.0020 B	<0.0014	<0.0014	<0.0019	<0.0019	<0.0014	<0.0019
Barium	0.118 B	0.115 B	0.113 B	0.113 B	0.113 B	0.112 B	0.0671 B	0.068 B
Beryllium	<0.0009	<0.0009	<0.00089	<0.00089	<0.00089	<0.00089	<0.00090	<0.00090
Calcium	94.6	90.5	80.8	81.1	77.2	77.7	78.1	75.0
Chromium	<0.0027	<0.0027	<0.0027	<0.0027	<0.0027	<0.0027	<0.0027	<0.0027
Cobalt	<0.0055	<0.0055	<0.0055	<0.0055	<0.0055	<0.0054	<0.0055	<0.0055
Copper	<0.0047	<0.0047	<0.0047	0.0051 B	<0.0056	<0.0061	<0.0047	<0.0047
Iron	0.649	0.587	<0.0289	<0.028	<0.0280	<0.0279	<0.0281	<0.0281
Lead	<0.0017	<0.0008	<0.00080	<0.0008	0.0013 B	<0.00079	<0.00082	0.001 B
Magnesium	28.1	27.0	24.4	24.5	23.3	23.5	23.7	22.9
Manganese	0.723	0.69	0.30	0.294	0.27	0.271	0.0289	0.0273
Mercury	<0.00009	<0.00009	<0.00009	<0.00009	<0.00009	<0.00009	<0.00009	<0.00009
Nickel	0.0081 B	0.0104 B	<0.0075	<0.0074	<0.0074	<0.0074	<0.0075	<0.0075
Potassium	2.18 B	1.86 B	0.895 B	1.7 B	0.966 B	0.779 B	1.04 B	1.04 B
Sodium	R	R	14.3	14.2	14.3	14.3	14.5	14.6
Vanadium	<0.0068	<0.0068	<0.0068	<0.0068	<0.0067	<0.0067	<0.0068	<0.0068
Zinc	<0.0074	<0.0124	<0.0190	<0.0195	<0.025	<0.0243	<0.0307	<0.0272
Cyanide	<0.0012	NA	<0.0012	<0.0012	NA	NA	<0.0012	NA

mg/L Milligrams per liter.
B Compound concentration is between instrument detection limit and the contract required quantitation limit.
NA Not analyzed.
R Unusable value.
J Estimated value.
Dup Duplicate.

Table 3-12. Detected Compounds in Groundwater/Leachate - Pesticides and PCBs, September 1993, 12th Street Landfill Operable Unit, Plainwell, Michigan.

Sample Location:	LH-2	LH-3
Sample ID:	T94020	T94018
Sample Date:	09/16/93	09/15/93
Units:	mg/L	mg/L
Parameters		
Aldrin	R	<0.00005 J

Dup Duplicate.
mg/L Milligrams per liter.
PCBs Polychlorinated biphenyls.
J Estimated value.
R Unusable value.
Z Compound coelutes with aroclor peaks on one or both columns.
Results are for unfiltered samples.

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Table 3-12. Detected Compounds in Groundwater/Leachate - Pesticides and PCBs, September 1993, 12th Street Landfill Operable Unit, Plainwell, Michigan.

Sample Location:	MW-5A	MW-5B	MW-6A	MW-6B	MW-7A	MW-7B	MW-8A	MW-8B	LH-1
Sample ID:	T94007	T94008	T94006	T94005	T94011	T94010	T94013	T94012	T94019
Sample Date:	09/10/93	09/10/93	09/09/93	09/09/93	09/13/93	09/13/93	09/13/93	09/13/93	09/16/93
Units:	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Parameters									
Aldrin	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	0.000027 JZ

Dup Duplicate.
mg/L Milligrams per liter.
PCBs Polychlorinated biphenyls.
J Estimated value.
R Unusable value.
Z Compound coelutes with aroclor peaks on one or both columns.
Results are for unfiltered samples.

Table 4-2. Detected Compound Concentrations and Cleanup Criteria of Organic and Inorganic Compounds in Surface Soil, 12th Street Landfill Operable Unit, Plainwell, Michigan.

Compound	Frequency Detected	Range of Concentrations (mg/kg)	Maximum Upgradient Concentrations (A) (mg/kg)	Type B Criteria Direct Contact Value (mg/kg)	Type C Criteria Direct Contact Value (mg/kg)
VOCs					
Acetone	11/16	0.029 - 0.29	ND	7800	15000
Carbon disulfide	2/16	0.007 - 0.017	ND	8600	16000
2-Butanone	2/16	0.012 - 0.065	ND	3600	6800
Toluene	1/16	0.003	ND	17000	33000
SVOCs					
4-Methylphenol	1/16	0.022	ND	1300	4500
2-Methylnaphthalene	1/16	0.12	ND	410	1400
Phenanthrene	4/16	0.044 - 0.58	ND	930	3200
Anthracene	3/16	0.020 - 0.065	ND	260000	900000
Carbazole	1/16	0.019	ND	NA	NA
Di-n-butylphthalate	3/16	0.026 - 0.040	ND	31000	110000
Fluoranthene	7/16	0.027 - 0.39	ND	31000	110000
Pyrene	7/16	0.027 - 0.34	ND	19000	67000
Benzo(a)anthracene	4/16	0.059 - 0.21	ND	0.18 (1)	2.1
Chrysene	6/16	0.020 - 0.25	ND	0.18 (1)	2.1
Benzo(b)fluoranthene	5/16	0.062 - 0.20	ND	0.18 (1)	2.1
Benzo(k)fluoranthene	5/16	0.076 - 0.22	ND	0.18 (1)	2.1
Benzo(a)pyrene	5/16	0.075 - 0.20	ND	0.18 (1)	2.1
Indeno(1,2,3-cd)pyrene	2/16	0.027 - 0.066	ND	0.18	NA
Benzo(g,h,i)perylene	1/16	0.032	ND	930	3200

Footnotes are on last page of table.

Table 4-1. Detected Compound Concentrations and Cleanup Criteria of Organic and Inorganic Compounds in Groundwater, 12th Street Landfill Operable Unit, Plainwell, Michigan.

(1) Number of samples for which criterion was exceeded.
NA Not available.
ND Not detected above quantitation limit.
ID Inadequate data to develop criterion.
GSI Groundwater- surface-water interface.
VOCs Volatile organic compounds.
SVOCs Semivolatile organic compounds.
mg/L Milligrams per liter.
(A) Includes results from MW-1, MW-2A, MW-2B, MW-3A, MW-3B, MW-4A, MW-4B, MW-5A, MW-5B, MW-6A, MW-6B, MW-7A, MW-7B.
(B) Includes results from MW-8A and MW 8B.
(C) Background may be submitted as cleanup criteria.
(D) GSI value may be proposed by the potentially responsible parties.
(E) GSI value is dependent on water hardness. Value presented was calculated by Michigan Department of Natural Resources (MDNR) using a hardness of of 178 mg/L calcium carbonate.
(H) Professional judgement used to determine that 50 parts per billion of aluminum in drinking water is protective of human health.
(K) Chemical has either not been evaluated by MDNR, or an inadequate database precludes development of a GSI value. Potentially responsible party may develop a proposed GSI value for MDNR review and approval.

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Table 4-2. Detected Compound Concentrations and Cleanup Criteria of Organic and Inorganic Compounds in Surface Soil, 12th Street Landfill Operable Unit, Plainwell, Michigan.

Compound	Frequency Detected	Range of Concentrations (mg/kg)	Maximum Upgradient Concentrations {A} (mg/kg)	Type B Criteria Direct Contact Value (mg/kg)	Type C Criteria Direct Contact Value (mg/kg)
Pesticides					
Heptachlor	1/15	0.0018	ND	0.28	3.3
Aldrin	1/16	0.016	ND	0.076	0.88
Endosulfan I	1/16	0.0037	ND	60	210
4,4'-DDE	5/16	0.004 - 0.025	ND	3.8	44
Endrin	2/16	0.003 - 0.006	ND	44	150
4,4'-DDD	1/16	0.0056	ND	5.4	62
4,4'-DDT	3/13	0.0032 - 0.023	ND	3.8	44
alpha-Chlordane	4/13	0.0032 - 0.027	ND	1.0	12
gamma-Chlordane	1/15	0.0031	ND	1.0	12
PCBs	11/14	0.023 - 4.7	ND	1.0 (2)	7.5

Footnotes are on last page of table.

Table 4-2. Detected Compound Concentrations and Cleanup Criteria of Organic and Inorganic Compounds in Surface Soil, 12th Street Landfill Operable Unit, Plainwell, Michigan.

Compound	Frequency Detected	Range of Concentrations (mg/kg)	Maximum Upgradient Concentrations (A) (mg/kg)	Type A Cleanup Criteria Acceptable Concentrations (mg/kg)	Type B Cleanup Criteria Direct Contact Value (mg/kg)	Type C Cleanup Criteria Direct Contact Contact Value (mg/kg)
Inorganic Constituents						
Aluminum	16/16	2800 - 20500	1940 (8)	6900 (5)	ID	ID
Antimony	2/16	12.5 - 17.4	ND (2)	NA	91	310
Arsenic	16/16	3.1 - 25.4	4.3 (7)	5.8 (12)	0.72 (16)	8.6 (9)
Barium	16/16	35.2 - 188	14.5 (14)	75 (12)	18000	63000
Beryllium	6/16	0.18 - 0.86	0.14 (3)	NA	NA	NA
Cadmium	1/16	1.5	ND (1)	1.2 (1)	130	450
Calcium	16/16	2500 - 149000	133000	NA	NA	NA
Chromium	16/16	7.4 - 48.8	7.1 (7)	18 (7)	1200	4300
Cobalt	14/16	2.3 - 10.5	3 (1)	6.8 (2)	NA	NA
Copper	16/16	3.0 - 51.7	6.8 (6)	32 (3)	9800	ID
Iron	16/16	7410 - 30100	12900	12000 (11)	ID	ID
Lead	16/16	6.8 - 116	4.9 (12)	21 (12)	400	400 (S)
Magnesium	16/16	1360 - 86900	38800	NA	NA	NA
Manganese	16/16	111 - 2980	408 (3)	440 (9)	1200 (3)	4300
Mercury	11/16	0.08 - 1.1	ND (11)	0.13 (7)	78	270
Nickel	15/16	4.5 - 28.4	6.9 (1)	20 (1)	20000	68000
Potassium	14/16	203 - 2050	234 (2)	NA	NA	NA
Selenium	12/16	0.31 - 4.8	0.74 (3)	0.41 (10)	1300	4500
Sodium	1/16	176	192	NA	1000000 (P)	1000000 (Q)
Vanadium	16/16	6.6 - 49.4	8.5 (6)	NA	2200	7800
Zinc	16/16	20 - 134	14.4 (12)	47 (12)	86000	300000

Footnotes are on last page of table.

Table 4-2. Detected Compound Concentrations and Cleanup Criteria of Organic and Inorganic Compounds in Surface Soil, 12th Street Landfill Operable Unit, Plainwell, Michigan.

VOCs	Volatile organic compounds.
SVOCs	Semivolatile organic compounds.
PCBs	Polychlorinated biphenyls.
NA	Not available.
ID	Inadequate data to develop criterion.
ND	Not detected above quantitation limit.
mg/kg	Milligrams per kilogram.
(1)	Number of samples for which criterion was exceeded.
{A}	Includes results from MW-8B.
{P}	Direct contact criterion is at saturation in soil. Criterion is actually greater than 100% in soil, hence it is reduced to 100%.
{S}	Type B criteria used as the default because no risk assessment tools are currently available to evaluate lead toxicity in adults.
{Q}	Direct contact criterion is at saturation in soil. Criterion was actually calculated as greater than 100% in soil, hence it was was reduced to 100%.

CI0091.001/TABLE4-2.WK1|LC\TB

Table 4-3. Detected Compound Concentrations and Cleanup Criteria of Organic and Inorganic Compounds in Subsurface Soil, 12th Street Landfill Operable Unit, Plainwell, Michigan.

Compound	Frequency Detected	Range of Concentrations (mg/kg)	Maximum Upgradient Concentrations (mg/kg)	Type B Cleanup Criteria 20X Drinking Water Value (mg/kg)	Type B Cleanup Criteria 20X GSI Value (mg/kg)
VOCs					
Acetone	11/16	0.003 - 0.90	ND	14	10
Carbon disulfide	4/16	0.005 - 0.035	ND	15	(D)
2-Butanone	6/16	0.014 - 0.29	ND	6.4	82
Benzene	2/16	0.009 - 0.046	ND	0.024 (1)	1.2
Toluene	2/16	0.006 - 0.014	ND	16	2.2
Ethylbenzene	3/16	0.008 - 0.04	ND	1.5	0.62
Xylene(Total)	5/16	0.010 - 0.26	ND	5.6	1.2
SVOCs					
Naphthalene	1/16	0.13	ND	5.0	0.58
2-Methylnaphthalene	4/16	0.031 - 2.1	ND	0.22 (1)	(D)
Diethylphthalate	1/16	0.070	ND	100	(D)
Fluoranthene	2/16	0.038 - 0.12	ND	17	7.4
Pyrene	1/16	0.27	ND	10	220
Pesticides					
beta-BHC	1/16	0.026	ND	NA	NA
gamma-BHC	1/16	0.0089	ND	NA	NA
Aldrin	4/16	0.0013 - 0.11	ND	(G)	(G)
4,4'-DDE	3/16	0.0047 - 0.68	ND	(G)	(G)
Endrin	1/16	0.006	ND	(G)	(G)
4,4'-DDD	2/16	0.031 - 0.13	ND	(G)	(G)
4,4'-DDT	2/16	0.16 - 0.46	ND	(G)	(G)
alpha-Chlordane	1/12	0.13	ND	0.00054 (1)	0.000011 (1)
PCBs	19/32	0.027 - 51.6	ND	(G)	(G)

Footnotes on last page of table.

Attachment 4

Updated 12th St.-OU4 RA Cost Estimate

12th Street OU 4
Remedial Action Cost Estimate

1. Delineation of Extent of PCB Contamination

a) Delineation of Extent of Woodland Contamination

Item	Unit/Cost	Quantity	Total
Field Technician(2)	$60/hr	80	$4,800
Staff Engineer/Scientist	$75/hr	40	$3,000
Survey	$1,500/day	2	$3,000
Core Tubes	$30/each	36	$1,100
Misc Expenses	Lump Sum	1	$5,000
Sample Analysis	$150/each	108	$16,200
		Subtotal:	**$33,100**

b) Delineation of Extent of Floodplain/Wetland Contamination

Item	Unit/Cost	Quantity	Total
Field Technician(2)	$60/hr	100	$6,000
Staff Scientist	$75/hr	50	$3,800
Survey	$1,500/day	3	$4,500
Core Tubes	$30/each	48	$1,400
Sample Analysis	$150/each	144	$21,600
Misc. Expenses	Lump Sum	1	$7,500
		Subtotal:	**$44,800**

c) Delineation of Extent of Adjacent Property Contamination

Item	Unit/Cost	Quantity	Total
Field Technician(2)	$60/hr	40	$2,400
Staff Scientist	$75/hr	20	$1,500
Survey	$1,500/day	2	$3,000
Core Tubes	$30/each	18	$500
Sample Analysis	$150/each	54	$8,100
Misc. Expenses	Lump Sum	1	$500
		Subtotal:	**$16,000**

d) Delineation of Extent of Former Powerhouse Discharge Channel Contamination

Item	Unit/Cost	Quantity	Total
Field Technician(2)	$60/hr	100	$6,000
Staff Scientist	$75/hr	50	$3,750
Survey	$1,500/day	3	$4,500
Core Tubes	$30/each	40	$1,200
Sample Analysis	$150/each	120	$18,000
Misc. Expenses	Lump Sum	1	$5,000
		Subtotal:	**$38,500**

Total for Delineation of Extent of PCB Contamination: $132,400

2. Remediation and Restoration of Contaminated Areas

a) Woodlands

Item	Unit/Cost	Quantity	Total
Clear and Grub	$3,025/acre	2.5	$7,600
Excavation	$5/cy	2000	$10,000
Restoration	$2/sf	62,500	$125,000
Staff/Scientist	$75/hr	100	$7,500
Misc. Expenses	Lump Sum	1	$5,000
VSR Samples	$150/each	20	$3,000
VSR Labor	$75/hr	40	$3,000
VSR Expense	Lump Sum	1	$2,000
		Subtotal:	**$163,100**

b) Floodplain Wetlands

Item	Unit/Cost	Quantity	Total
Clear and Grub	$3,025/acre	2.3	$7,000
Excavation	$5/cy	6,600	$33,000
Restoration	$2/sf	102,000	$204,000
Staff Scientist	$75/hr	325	$24,400
Misc. Expenses	Lump Sum	1	$5,000
VSR Samples	$150/each	68	$10,200
VSR Labor	$75/hr	140	$10,500
VSR Expense	Lump Sum	1	$5,000
		Subtotal:	**$299,100**

c) Adjacent Property

Item	Unit/Cost	Quantity	Total
Clear and Grub	$3,025/acre	0.7	$2,100
Excavation	$5/cy	1,000	$5,000
Restoration	$2/sf	30,000	$60,000
Staff Scientist	$75/hr	70	$5,300
Misc. Expenses	Lump Sum	1	$15,000
VSR Samples	$150/each	20	$3,000
VSR Labor	$75/hr	40	$3,000
VSR Expense	Lump Sum	1	$2,000
		Subtotal:	**$95,400**

d) Former Powerhouse Discharge

Item	Unit/Cost	Quantity	Total
Sheet Piling (recovered)	$20/sf	21,000	$420,000
Access Road	$12/sf	1500	$18,000
Dewatering	$720/day	60	$43,200
Carbon	$1/lb	6,000	$6,000
Carbon Column	$13,000/each	2	$26,000
Equalization Tank	$30,000/each	1	$30,000

(100,000 gal)			
Prefilter/Pump Assembly	$5,000/each	1	$5,000
Excavation	$30/cy	2,700	$81,000
Restoration	$2/sf	82,500	$165,000
Staff Scientist	$75/hr	600	$45,000
Misc. Expenses	Lump Sum	1	$20,000
VSR Samples	$150/each	44	$6,600
VSR Labor	$75/hr	88	$6,600
VSR Expense	Lump Sum	1	$4,000
		Subtotal:	**$876,400**

Subtotal of Remediation and Restoration of Contaminated Areas:	**$1,434,000**
Contingency at 30%:	**$430,200**
Total of Remediation and Restoration of Contaminated Areas:	**$1,864,200**

3. Design

a) Former Powerhouse Discharge Channel

Item	Unit/Cost	Quantity	Total
Lead Engineer	$140/hr	200	$28,000
Staff Engineer	$75/hr	500	$37,500
Drafter	$60/hr	500	$30,000
Misc. Expenses	Lump Sum	1	$5,000
		Subtotal:	**$100,500**

b) Gas Venting/Cap System

Item	Unit/Cost	Quantity	Total
Lead Engineer	$140/hr	40	$5,600
Staff Engineer	$75/hr	150	$11,300
Drafter	$60/hr	100	$6,000
Misc. Expenses	Lump Sum	1	$500
		Subtotal:	**$23,400**

c) Leachate Collection System

Item	Unit/Cost	Quantity	Total
Lead Engineer	$140/hr	80	$11,200
Staff Engineer	$75/hr	150	$11,300
Drafter	$60/hr	100	$6,000
Misc. Expenses	Lump Sum	1	$1,000
		Subtotal:	**$29,500**

e) Meetings; Workplans; Additional Civil/Site Design

Item	Unit/Cost	Quantity	Total
Lead Engineer	$140/hr	200	$28,000
Staff Scientist/Engineer	$75/hr	800	$60,000
Drafter	$60/hr	400	$24,000
Misc. Expenses	Lump Sum	1	$18,000
		Subtotal:	**$130,000**

Total for Design: $283,400

4. Construction

a) Alternative 2: Landfill Closure (Reconsolidation of Outlying Residuals/Act 451 Cap/Deed Restrictions) [Ref: Table 4-1, G&M FFS, July 1997]

Item	Unit/Cost	Quantity	Cost
Mobilization/ Demobilization	$75,000/ls	1	$75,000
Clearing and Grubbing	$8,000/acre	6.5	$52,000
Prepare Staging Area	$20,000/ls	1	$20,000
Installation of Turbidity Curtain	$31/lf	300	$9,300
Prepare Access Road	$12/sy	900	$10,800
Reconsolidating of Outlying Residual	$47/ton	18,450*	$867,200
Recontouring of existing Grade	$3/CY	34,000	$102,000
Subbase Sand layer for Flexible Membrane	$10/cy	2,500	$25,000
Low Permeability Layer (FML)	$5.40/sy	30,000	$162,000
Frost Protection Layer	$10/cy	20,000	$200,000
Top Soil Layer	$13/cy	5,000	$65,000
Hydroseeding	$.40/sy	30,000	$12,000
Stormwater Runoff Controls	$20,000/ls	1	$20,000
Dike/Sideslope Stabilization	$260/lf	500	$130,000
Fencing	$16/lf	1,800	$28,800
Restoration of Affected Areas	$2/sf	60,000	$120,000

Note: * Estimated from volume excavated from Woodland, Floodplain/Wetland, Adjacent Property, and Former Powerhouse Discharge Channel times 1.5 tons per cubic yard factor

Subtotal: $1,899,100

b) Leachate Collection/Treatment System

Item	Cost/Unit	Quantity	Cost
Leachate Sump	$4,000/each	1	$4,000
Leachate Treatment System controls	$20,000/ls	1	$20,000
Leachate Trench	$50/lf	1500	$75,000

Subtotal: $99,000

c) Gas Venting System

Item	Cost/Unit	Quantity	Cost
Vent with cap	$200/ea	20	$4,000
Gravel bed	$16/cy	20	$300
Labor	$60/hr	160	$9,600

Subtotal: $13,900

d) Services During Construction

Item	Cost/Unit	Quantity	Cost
Labor	Lump Sum	1	$226,000
Misc. Expenses	Lump Sum	1	$50,000
		Subtotal:	**$276,000**

Subtotal Construction Cost:	**$2,288,000**
Contingency at 20%:	**$457,600**
Total Construction Cost:	**$2,745,600**

5. Operation & Maintenance - Present worth - 30 years, 7% discount rate

a) Operation and Maintenance Costs [Ref: Table 4-1, G&M FFS, July 1997]

Item	Cost/Unit	Quantity	Annual Cost
Cap Inspections	$500/quarterly	4	$2,000
Cap Repairs	$2,000/yearly	1	$2,000
Environmental Monitoring/Reporting	$10,000/yearly	1	$10,000

Subtotal Annual Cost: $14,000
Subtotal PW for 30 years: $173,700

b) Leachate Treatment System

Item	Cost/Unit	Quantity	Annual Cost
Carbon	$1/lb	3000	$3,000
Operator	$75/hr	180	$13,500
Lab - PCB Aroclor	$150/each	24	$3,600
Misc. Expenses	$1000/month	12	$12,000

Subtotal Annual Cost: $32,100
Subtotal PW for 30 years: $398,300

c) Supplemental O&M (semi-annual PCBs all 15 wells for 30 years, accounts for 6 wells in G&M estimate)

Item	Cost/Unit	Quantity	Annual Cost
Labor	$75/hr	64	$4,800
Lab - PCB Aroclor	$150/each	24	$3,600
Misc. Expenses	$500/each	2	$1,000

Subtotal Annual Cost: $9,400
Subtotal PW for 30 years: $116,600

d) Supplemental O&M (quarterly sampling for first two years)

Item	Cost/Unit	Quantity	Annual Cost
Labor	$75/hr	128	$9,600
Lab - PCB Aroclor	$150/each	54	$8,100
Lab - VOCs	$100/each	54	$5,400
Lab - semi-VOCs	$150/each	54	$8,100
Misc. Expenses	$500/month	4	$2,000

Subtotal Annual Cost: $33,200
Subtotal PW for 2 years: $60,000

Total of O&M Annual Costs (first 2 years): $88,700
Total of O&M Annual Costs (next 28 years): $55,500
Total Present Worth of O&M Annual Costs (30 years): $748,600

Total Present Worth Estimate of Costs for 12th Street OU4 Remedial Action: $5,774,200

STATE OF MICHIGAN

JOHN ENGLER, Governor

DEPARTMENT OF ENVIRONMENTAL QUALITY

"Better Service for a Better Environment"

HOLLISTER BUILDING, PO BOX 30473, LANSING MI 48909-7973

INTERNET: www.deq.state.mi.us

RUSSELL J. HARDING, Director

September 28, 2001

Mr. William E. Muno, Director
Superfund Division
United States Environmental Protection Agency
Region 5
77 West Jackson Boulevard (S-6J)
Chicago, Illinois 60604-3590

Dear Mr. Muno:

The Michigan Department of Environmental Quality (MDEQ), on behalf of the state of Michigan, is submitting for your review, concurrence, and signature, the enclosed Record of Decision (ROD) for the 12th Street Landfill-Operable Unit 4 (12th St.-OU4) of the Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund site located in Kalamazoo and Allegan Counties, Michigan. The MDEQ has worked very closely with the United States Environmental Protection Agency (U.S. EPA) during the development of this ROD. In addition to meeting federal requirements, this remedy meets state cleanup requirements, including limited industrial cleanup criteria, pursuant to Part 201, Environmental Remediation, of the Natural Resources and Environmental Protection Act, 1994 PA 451, as amended (NREPA), and Part 115, Solid Waste Management, of the NREPA. Please return one signed copy of the ROD to Mr. Robert Franks, Superfund Section, Environmental Response Division.

The MDEQ looks forward to the successful completion of the final remedy for the 12th St.-OU4 of the Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund site. If you have any questions, please contact Mr. Keith Krawczyk, Project Manager, Superfund Section, Environmental Response Division, at 517-335-4103, or you may contact me.

Sincerely,

Russell J. Harding
Director
517-373-7917

Enclosures
cc: Ms. Wendy Carney, U.S. EPA
Mr. Craig Mankowski, U.S. EPA
Mr. Thomas Short, U.S. EPA
Mr. Alan J. Howard, MDEQ
Ms. Claudia Kerbawy, MDEQ
Mr. Robert Franks, MDEQ
Mr. Brian von Gunten, MDEQ
Mr. Keith Krawczyk, MDEQ